Software Compliance Guide

COM*check-EZ*

You can use COM*check-EZ*™ to demonstrate that your commercial or high-rise residential building design complies with the 2000 Edition of the International Energy Conservation Code (IECC). COM*check-EZ* includes a software method and a manual method for demonstrating compliance.

The COM*check-EZ* software provides a highly flexible way to demonstrate compliance with minimal input. The envelope section allows tradeoffs between envelope components, including roofs, walls, windows, floors, and skylights. The lighting section enables you to quickly determine if your lighting design meets interior-lighting power limits. The mechanical section enables you to assemble a customized list of code requirements that are applicable to the systems and equipment in your building.

This guide describes how to install and use the COM*check-EZ* software, Version 2 for Windows. If you have obtained a printed copy of these materials, a CD-ROM containing the software is attached to the inside back cover. You can access a U.S. Department of Energy Building Standards and Guidelines Program (BSGP) web site at http://www.energycodes.org to learn about COM*check-EZ* and get free downloads of the complete package of materials. If you have more questions, call the BSGP hotline at 1-800-270-CODE or send email to TechSupport@pnl.gov.

Getting Started

What You Need to Run COM*check-EZ*

COM*check-EZ* requires a Windows-based computer with at least the following hardware and software:

- an 80486 processor

- 6 MB extended RAM

- a VGA or Super VGA monitor

- a Microsoft-compatible mouse.

COM*check-EZ* Version 2 is a Windows application and requires Microsoft® Windows® 95, 98, NT 4.0 or later.

Installing COM*check-EZ*

You must install COM*check-EZ* onto your hard disk as instructed below. Before installing the software, make sure your computer meets the minimum hardware and software requirements.

To install COM*check-EZ* from the CD-ROM:

1. Insert the CD into the CD drive of your computer. The AutoRun dialog will automatically appear.

2. Select *Install COMcheck-EZ Software*.

3. To run the COM*check-EZ* software after installation, select *Programs* from the *Start* button and select COM*check* from the programs list. Alternatively, if you are using Windows Explorer or File Manager you can change to the COM*check* subdirectory and double-click on the COM*check* icon.

If the AutoRun dialog does not appear:

1. Select the *Start* button from the task bar and choose *Run* from the menu.

2. Type <source>\setup.exe (where <source> is the CD drive letter).

3. Click **OK** and follow the previous instructions.

Starting COM*check-EZ*

From the **Start** button, select *Programs*, then select COM*check* from the programs list. Alternatively, if you are using Windows Explorer or File Manager you can change to the COM*check* subdirectory and double-click on the COM*check* icon.

Screen Layout

Title Bar - The title bar displays the name of the currently open project data file and the currently selected code. If no file is open, the word *Untitled* is displayed.

Menu Bar - The menu bar is located directly under the title bar and displays the available menus–*File, Edit, View, Options, Code,* and *Help*. These menus are discussed in more detail in the following sections.

Folder Tabs - The *Project, Envelope, Lighting, and Mechanical* folder tabs are used to move between major sections of the program.

Buttons - The buttons located directly under the folder tabs are used to create a list of envelope, lighting, and mechanical components representing your design.

User Prompts and Status Messages - The bottom left corner of the screen displays user prompts and status messages.

Compliance Results - The bottom right corner of the screen displays color-coded compliance results as a percentage by which performance is better or worse than the minimum required by the code. For example, a +10.0% in green on white would indicate the proposed design passes the envelope requirements with heating plus cooling loads 10% below the maximum allowed. A -5.0% in red on white would indicate the loads exceed those allowed and must be reduced by roughly 5% to achieve compliance.
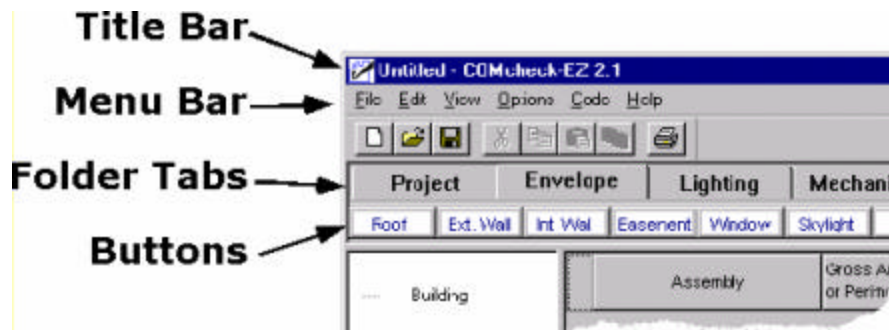
Partial Screen Layout

Text Colors Used in the Software

Colors Used In Table Fields

Black text on white background indicates the field is editable by the user.

Black text on gray background indicates the data were calculated by the program and are not directly editable by the user.

Dark blue text on white background indicates the data were selected from a drop-down list. Clicking on such fields with the left mouse button will redisplay the appropriate list.

Red-on-white text indicates data are either missing or not within a valid range.

White-on-red text is displayed in the *R-value* or *U-factor* field of an envelope assembly that violates a mandatory code requirement. A building DOES NOT comply if any R-value or U-factor violates a mandatory requirement, even if the overall envelope compliance index is positive.

Colors Used In Compliance Fields

Red-on-white compliance results indicate the design does not comply.

Green-on-white compliance results indicate the design does comply.

The letters *TBD* (to be determined) in **blue on gray** indicate you have provided insufficient data for a compliance calculation. To determine which data are invalid, look for fields with red on white text. In addition to providing inputs for all red on white fields, you must select at least one building use type on the *Project* screen before compliance can be determined.

Table Columns and Rows

Many of the main screens have grid-like tables used to enter and store data. You can delete, move, collapse, and expand the rows and columns in the tables.

Rows

To select a row, click on the leftmost column of that row (the column containing row numbers). The row will be reversed (black background) when correctly selected. You

can also select multiple rows by holding down the left mouse button on the left-hand column and dragging it over the desired rows.

Rows can be moved by:

1. selecting the row(s) to be moved (as described above),

2. releasing the mouse button,

3. clicking the mouse button on the leftmost column of any of the selected rows (a small box will appear at the tail end of the arrow cursor),

4. dragging the mouse to the new location-a thin red line will appear indicating where the row(s) should be placed,

5. releasing the mouse button when the red line has been placed in the desired location.

Arrow cursor when dragging rows or columns.

On the main screens, a single table row can also be moved by dragging the corresponding row label in the tree located to the left of the table. Click the mouse on the desired label and drag it to another label on the tree. After releasing the mouse, the dragged label (and row) will be positioned directly under the label on which it was dropped. Some restrictions apply to the placement of rows. In the *Envelope* screen, for example, window and door rows can be placed only under exterior wall or basement wall rows. Skylight rows can be placed only under roof rows.

On the main screens, you can collapse and expand rows by using the tree located to the left of the table. Rows that fall below a "parent" row on the tree can be collapsed so they are not displayed. For example, an exterior wall row with several windows and doors under it can be collapsed to hide the windows and doors. A tree label with a minus sign to the left of the label is already expanded. It can be collapsed by clicking on the box containing the minus sign. Tree labels that are already collapsed have a plus sign to the left of the label. They can be expanded by clicking the box containing the plus sign. Clicking the plus or minus sign to the left of the *Building* label will expand or collapse all rows in the table.

Columns

You can move table columns by selecting a single column by clicking the left mouse on the column heading. Select multiple columns by pressing the left mouse and dragging it over the desired column headings. Selected columns will be reversed (black background).

Columns can be moved by:

1. selecting the column(s) to be moved (as described above),

2. releasing the mouse button,

3. clicking the mouse button on the column heading of any of the selected columns (a small box will appear at the tail end of the arrow cursor),

4. dragging the mouse to the new location-a thin red line will appear indicating where the column(s) should be placed,

5. releasing the mouse button when the red line has been placed in the desired location.

Table column widths can be modified by moving the mouse over the right edge of the corresponding column header until the mouse pointer changes to a double-sided arrow until the mouse pointer changes to a double-sided arrow. ✛

When the mouse pointer changes, drag the column to the desired width. Columns that have been totally collapsed can be restored by double-clicking the mouse on the column header separation (the vertical line in the top row representing the hidden column).

File Menu

Use the *File* menu to open existing project data files (**O***pen*) and save your project data (*Save*). The *New* option allows you to erase the current data and begin a new project data file. The *Save As* option allows you to save your current project data file to a new name. The program provides options for previewing and printing compliance reports, and for directing output to selected printers (*Print Preview*, *Print Report*, and *Print Setup*, respectively). You can also save the compliance report to a file in rich text format [rtf] (*Save Report*) for inclusion in another document. An example building file is provided with the software.
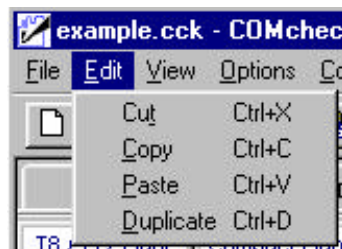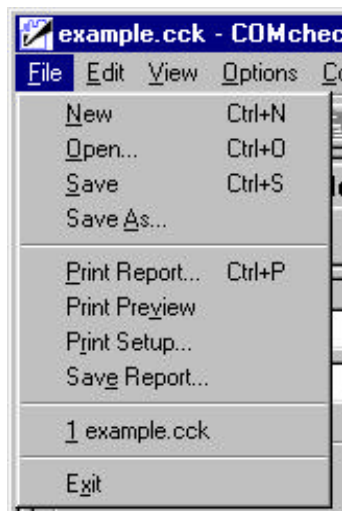

File Menu

Edit Menu

Use the *Edit* menu to cut, copy, paste, and duplicate data in the tables. You can also click the right mouse button on any field or tree label to display a pop-up list with these same options (see *Context Menu*).

Edit Menu

The edit commands can be applied to individual table cells, to a selected table row, or to multiple selected rows. To select multiple rows, press the left mouse button on the left-

hand column and drag it over the desired rows. The rows will be reversed (black background) when correctly selected.

Cut

Use the *Cut* option to delete the highlighted text in a cell. You can paste the deleted text into another cell of the same type. If one or more rows in the table are selected, the rows will be deleted.

Copy

Use the *Copy* option to copy the highlighted text in a cell. The copied text can be pasted into another cell of the same type. You can also copy an entire row by selecting the row and choosing *Copy* from the *Edit* menu or clicking the right mouse button on the tree label corresponding to that row.

Paste

Use the *Paste* option to paste the last copied text into a selected cell or row. Note that you can only paste cell data or row data of the same type. For example, you can paste a row containing a roof assembly into another row containing a roof assembly, but not into a row containing a window assembly.
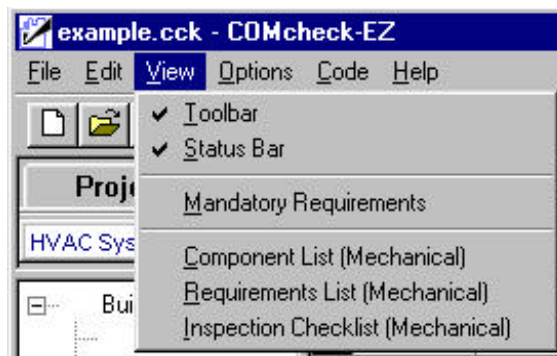
Duplicate

Use the *Duplicate* option to duplicate an entire row. You can only duplicate rows; not individual fields.

View Menu

Use the *View* menu to view or hide software features.

View Menu

Toolbar and Status Bar

The *Toolbar* and *Status Bar* options hide or display the Toolbar or Status Bar.

Mandatory Requirements

The *Mandatory Requirements* option displays requirements that must be met by all buildings in addition to the requirements determined to be applicable by the software. You may view and print separate mandatory requirements for Envelope, Lighting, and Mechanical.

Component List (Mechanical)

The *Component List* option displays a table on the right side of the *Mechanical* screen. The table contains all HVAC system, plant, and water-heating components you have created. The table also contains a column for entering the quantity of each component.

Requirements List (Mechanical)

The *Requirements List* option displays a comprehensive description of requirements applicable to the selected component or system. If you select the *Building* label in the tree at the left of the screen, the list of requirements applicable to all building systems is displayed. If you select a specific mechanical component label in the tree, the requirements applicable to only that component are displayed.

Inspection Checklist (Mechanical)

The *Inspection Checklist* option is another way to view the lists of requirements. This option displays the same lists of requirements as the *Requirements List* option but in an abbreviated (checklist) format. Selecting the *Building* label in the tree displays the list of requirements for the building. Selecting a specific mechanical component label displays the requirements applicable to only that component.

Options Menu

Use the *Options* menu to toggle optional software features on or off. All features under the *Options* menu are optional--none are required to demonstrate compliance.

Options Menu

Orientation (Envelope)

Use the *Orientation* option to add a column to the *Envelope* screen to select *North*, *East*, *South*, or *West* orientations for each exterior wall, window, door, and basement wall assembly. If an orientation is selected for an assembly linked to other assemblies (such as a window linked to an exterior wall), the orientation for all of the linked assemblies is changed to match the new selection.

If an orientation has been assigned to each wall, window, door, and below-grade wall assembly, the compliance calculation will be based on a proposed building using those orientations. This result may be slightly different than the result obtained when orientation is not specified. In the latter case, assemblies are assumed to be equally distributed according to a code-specified aspect ratio. The orientation-specific compliance calculation will not be performed until *all* assemblies have been assigned an orientation.

Daylight Control Factor (Envelope)

If you select *Daylight Control Factor*, COM*check-EZ* adds two columns to the *Envelope* screen--*DLCF* (daylight control factor) and *VLT* (visible light transmittance). To receive credit for DLCFs, you must enter the DLCF for all exterior wall, window, and door components; the VLT for each window; and the orientation of each exterior wall, window, door, and basement wall assembly.

The daylight control factor (DLCF) option offers modest credit toward envelope compliance where automatic lighting controls for daylight use are used. To activate this option, select *Daylight Control Factor* from the *Options* menu. When this option is selected, two new columns are added to the table on the *Envelope* screen. The *VLT* column is used to enter the visible light transmittance (VLT) of windows. The *DLCF* column is used to enter the daylight control factor.

The DLCF is the fraction of the installed lighting power within 15 ft of the exterior wall that will be automatically controlled for daylight use. The software accepts values from 0.0 to 1.0. If the lights will not be controlled for daylight use, the appropriate value to use is zero.

DLCF is an attribute of a daylit exterior zone, of which windows, the electric lighting systems, and the daylight control systems are parts. Thus, whatever DLCF value you enter applies uniformly to all components of the daylit zone, which includes an exterior wall and all windows and doors that penetrate the wall. Changing the DLCF for one of these components changes it for them all. To calculate DLCF, sum the wattage of all electric lights in a 15-ft deep daylit zone that runs the length of the exterior wall, then calculate the decimal fraction of that wattage controlled by daylight sensors.

This feature of the code is intended to permit the use of higher window-wall ratios and higher VLT glazings when used in conjunction with automatic lighting controls for daylighting. Use of DLCF and VLT are only appropriate where such controls are to be used.

The DLCF is dependent on orientation, so components must be entered using the *Orientation* option if *Daylight Control Factor* is selected. If the *Orientation* option was not previously selected, the software will automatically select it and add the *Orientation* column to the table. If a DLCF is entered for an assembly linked to other assemblies (such as a window linked to an exterior wall), the DLCF for all linked assemblies is changed to match the new value.

Visible Light Transmittance (Envelope)

VLT is the decimal fraction of visible light that passes through the window. The software accepts values from 0.0 to 1.0. See manufacturer's literature for the correct value to use with your selected glazing product. For a typical VLT value for the glazing characteristics you have selected, click with the right mouse button on the VLT input field and select *Use Typical*. The *Use Typical* feature provides values that can be used in preliminary evaluations before actual product selections have been made. The VLT input column is displayed only after the DLCF option has been selected from the *Options* menu and provides benefit only when used in conjunction with DLCF.

Spaces (Lighting)

The *Spaces* option allows you to link lighting fixtures to spaces within the building. The tree on the left side of the *Lighting* screen shows the linkage between each space and the fixtures within it. The *Spaces* option is recommended because it simplifies verification of fixture counts.

Exemptions and Allowances (Lighting)

To identify an exempt fixture, first make sure *Exemptions and Allowances* is checked in the *Options* menu.

Exemptions

To use the optional exemptions feature, click the mouse on the *Exemption/Allowance* column of that fixture. A pop-up list will be displayed giving you a choice of *None*, *Exemption*, or *Allowance*; select *Exemption*. A second list will be displayed giving you a choice of the types of exemptions available under the code. Select the type of exemption that applies to the fixture type, or *None* if the fixtures do not qualify for an exemption. When a set of lighting fixtures is identified as exempt, the power for the fixtures is omitted from the wattage total for the building. We recommend that all fixt ures-both exempt and nonexempt-be listed in order to clarify where exemptions have been claimed and to streamline plan review and inspection.

The 2000 IECC permits fixtures used for the following purposes to be treated as exempt from inclusion in interior lighting power totals:

1. Special Medical/Dental/Research Lighting

2. Professional Sports Arena Playing Field Lighting

3. Gallery/Museum/Monument Exhibits

4. Lighting in Residential Dwelling Units - including guest room lighting in hotels, motels, boarding houses, high-rise multifamily housing, and similar buildings

5. Emergency Lighting (Automatic Control) – emergency lighting that is automatically off during normal building operation

Allowances

To use the optional allowances feature, click the mouse on the *Exemption Allowance* column of that fixture. A pop-up list will be displayed giving you a choice of *None*, *Exemption*, or *Allowance*--select *Allowance*. A second pop-up will list the allowances available for that fixture, and a third pop-up will list the building use types that can be used for that allowance. The following allowances may be claimed under the 2000 IECC code:

Decorative – qualifying lighting 1) must be for decorative purposes, 2) must be in addition to general lighting, 3) must be controlled on separate circuits from general lighting, and 4) the entered area must include only the floor area of the space containing the decorative lighting.

Visual Display Terminals – qualifying lighting 1) must be installed to meet requirements of visual display terminals (VDT) as the primary viewing task and 2) for the entered area, must include only the floor area of the space containing the VDT lighting.

Merchandise Display – qualifying lighting must be 1) installed to highlight specific merchandise, 2) in addition to general lighting, 3) and controlled on separate circuits

from general lighting; the entered area must be the area of the specific merchandise display and NOT the floor area of the space.

Fine Merchandise Display – qualifying lighting must be 1) installed to highlight fine merchandise such as jewelry, fine apparel, and accessories or china and silver, 2) in addition to general lighting, 3) and controlled on separate circuits from general lighting; the entered area must be the area of the actual case or shelf area for displaying and selling fine merchandise and NOT the floor area of the space.

Emergency Medical/Pharmacy – qualifying lighting must be installed in spaces designed for emergency, recovery, medical supply, or pharmacy.

Allowances are only available for certain whole building types and area category types and can only be taken if one of these building types has already been created on the *Project* screen. If none of the applicable building use types has been created, the *Allowance* option will be disabled (gray). The following table lists the building use types for which power allowances are permitted, the applicable allowance type, and the maximum allowance in W/ft^2 that is applied by the software.

Whole Building Type	Area Category	Allowance Type	Allowance (W/ft^2)
---	Bank/Financial Institution	Decorative	1.0
---	Classroom/Lecture Hall	Visual Display Terminals	0.35
---	Convention, Conference or Meeting Center	Decorative	1.0
---	Dining	Decorative	1.0
Exercise Center	Exercise Center	Decorative	1.0
Grocery Store	Grocery Store	Merchandise Display	1.6
---	Hotel Function	Decorative	1.0
Library	Library	Decorative	1.0
---	Lobby-Hotel	Decorative	1.0
---	Lobby-Other	Decorative	1.0
Medical and Clinical Care	Medical and Clinical Care	Visual Display Terminals	0.35
		Emergency Medical/Pharmacy	1.0
Museum	Museum	Visual Display Terminals	0.35
Office	Office	Visual Display Terminals	0.35
Religious Worship	Religious Worship	Decorative	1.0
Restaurant	Restaurant	Decorative	1.0
Retail Sales, Wholesale Showroom	Retail Sales, Wholesale Showroom	Merchandise Display	1.6
		Fine Merchandise Display	3.9
Theaters-Performance	Theaters-Performance	Decorative	1.0

After selecting the building use type, a dialog appears asking for the floor area (ft^2) that the allowance applies to. The software will not allow entry of a floor area larger than the floor area indicated on the *Project* screen for that building use type. The software
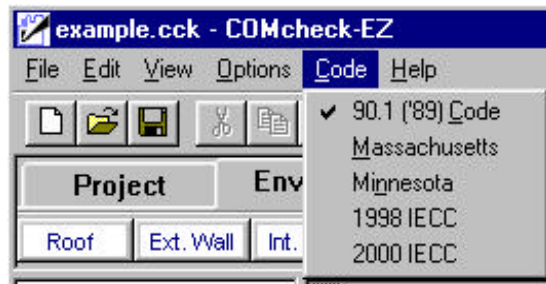
multiplies the allowance (listed in the third column of the table above) by the square footage entered in this dialog to determine the amount of additional wattage added directly to the *Allowed Wattage* total. This allowance, however, cannot exceed the total proposed wattage of the fixture(s) (the *Number of Fixtures* times the *Fixture Wattage*).

The selected allowance, building use type, and floor area are copied to the *Exemption Allowance* field on the *Lighting* table. You can expand this field to read the entire entry by dragging the right grid line of the *Exemption Allowance* column header to the right.

Code Menu

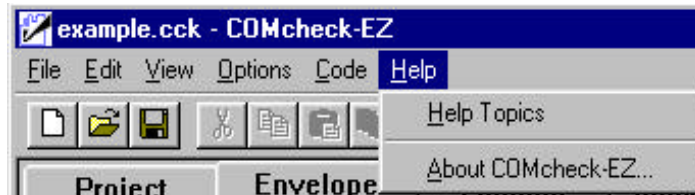Use the *Code* menu to select which code version you want the program to use when determining compliance.

Code Menu

Help Menu

The *Help* menu provides general information on how to use COM*check-EZ.* The *Help Topics* option displays all of the Help topics within COM*check-EZ.* The *About COMcheck-EZ* option displays the program's version number and release date.


Help Menu

Context Menu

Clicking the right mouse button on a tree label or table displays a pop-up list, referred to as a context menu. The context menu options are applied to a single field in a table or to an entire row in a table, depending on where the mouse is clicked. If the mouse is clicked on a tree label, the menu options are applied to the row corresponding to that label. If the mouse is clicked on the left field of a row in a table, the options are applied to the entire row. Some options are applicable to individual fields of a table, and the mouse must be clicked on the given field to activate the option.
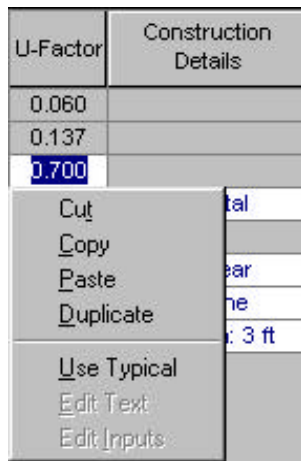
Context Menu

Cut, Copy, Paste, and Duplicate

The *Cut*, *Copy*, *Paste*, and *Duplicate* options are available from the *Edit* menu in the menu bar, from toolbar buttons, and from the context menus. See the previous section on the *Edit* menu for a description of these options. The *Cut*, *Copy*, and *Paste* options can be applied to individual fields in a table as well as to entire rows. The *Duplicate* option, however, is always applied to an entire row or rows.

You cannot copy a row of one type and paste it over a row of another type. For example, you cannot copy a row in the *Envelope* table containing a roof component and paste it in a row already containing a window component--this will generate an error message.

Use Typical

The *Use Typical* option enables you to enter a common value for products having the characteristics you have selected. You can use this feature in initial compliance checking before actual products have been selected. **However, products used in the building must meet or exceed the performance you assume in the compliance analysis.**

The *Use Typical* option places a common value into an individual field of a table. For example, after selecting a window component and describing the glazing and frame characteristics of that window, you can right-click the *U-Factor* column of the window component and select the *Use Typical* option from the context menu. The software will supply a window U-factor that is "typical" for a window with those characteristics. Select *Use Typical* by right-clicking on the *SHGC* column or the *VLT* column, and the software will provide a typical solar heat gain coefficient (SHGC) value or a typical visible light transmittance (VLT) value for the window.

You can also right-click in the *Fixture Wattage* column on the *Lighting* screen; then select *Use Typical* to have the software provide a typical fixture input wattage, i.e., for the lamp/ballast combination.

Edit Text

The *Edit Text* option is used to edit the text on a tree label. When you create a new envelope assembly, lighting fixture, or mechanical component, a new row appears in the corresponding table and a new tree label appears on the tree to the left. The tree labels are assigned default names such as *Roof 1* or *Incandescent 2*. These labels can be

changed by clicking the right mouse button on the label and selecting *Edit Text* from the context menu. An edit box will become visible where the label used to be, and you can rename the label by typing in the edit box. Press **Enter** or click elsewhere when finished. You can enter a maximum of 128 characters in the edit box. You can also edit tree labels by double-clicking on the label.

Edit Inputs

The *Edit Inputs* option is only available when right-clicking on a tree label in the *Mechanical* screen. The *Mechanical* screen components are created using pop-up screens (called dialogs) or a series of such screens (called a wizard). If you want to change any of the inputs for a particular mechanical component, click the right mouse button on the tree label for that component and select *Edit System Inputs*, *Edit Plant Inputs*, or *Edit SWH Inputs* (the context menu option changes depending on which type of mechanical component you have selected). The input screen(s) will be redisplayed with your original inputs, which you can change.

Project Screen

The *Project* screen is used to provide the software with information such as: 1) the location of the proposed building (state and city) and 2) the building use category and area. You may also enter specific project information that identifies and describes your project.

Location

COM*check-EZ* lists the available cities for each state. If your city is not listed, choose the closest city with similar weather conditions or consult with your local building department.

Building Use

Use the *Whole Building* compliance method for buildings that entirely match one of the available building types. Use the *Area Category* compliance method for mixed-use buildings when detailed information about space usage is available. For some projects, you may have a choice of which compliance method to use.

A list of building types or area categories is displayed when you click the left mouse in the *Whole Building Type* or *Area Category* column of the *Building Use* table. The *Assembly*, *Hotel/Motel*, and *Multifamily* options displayed in the whole-building types list are only available for envelope compliance. To make them available, you must select the *Envelope and/or Mechanical Compliance Only* checkbox. If lighting compliance is to be determined for one of these building types, you must use the area category method of compliance.

Envelope Screen

Use the blue-on-white buttons at the top of the *Envelope* screen to create a list of building components present in your proposed design. Each component you select is added to the building components displayed on the *Envelope* screen. For each component, enter appropriate values for all fields with white backgrounds. These fields may include the assembly type, area (or perimeter), cavity R-value, continuous R-value, assembly U-factor, construction details, SHGC, and/or projection factor. To view an example building description, load the EXAMPLE file.

Concrete slab-on-grade components require a perimeter entered in linear feet. All other components require an area entered in square feet. The cavity R-value input is used for insulation placed between structural members, while the continuous R-value input is used for insulation that is continuous across the structure such as rigid-roof insulation or insulating wall sheathing.

After you have completed the description of each new component, the program automatically updates the compliance results. The results are displayed at the bottom of the screen in the *Envelope* box. If *TBD* (to be determined) is displayed in this field, you have not filled in all necessary fields. To determine which data are missing or invalid, look for fields with red-on-white text. In addition to providing inputs for all red-on-white fields, you must select at least one building use type and provide its area on the *Project* screen before the software can determine compliance.

Roofs

Roofs include portions of the building envelope that are above conditioned space and are horizontal or tilted at less than 60 degrees from horizontal.

Select the *Roof* button to add a roof component to the description of your design on the *Envelope* screen. Enter each unique roof assembly as a separate component. You can enter multiple roof elements sharing the same construction as one component with appropriate total area.

Roof Types

1. *All-Wood Joist/Truss* - wood frame roof structures in which insulation is placed between structural roof members; e.g., batt or loose-fill insulation in cathedral ceilings or attic spaces.

2. *Nonwood Joist/Truss* - metal frame roof structures in which insulation is placed between structural roof members; e.g., steel bar joists or trusses with metal webs having insulation below the roof deck.

3. *Structural Slab* - any roof structure in which the roof is insulated primarily or exclusively using continuous rigid insulation above the roof deck.

4. *Metal Roof without Thermal Blocks* - metal building roofs where roof insulation is draped across metal structural members and metal roofing is attached to the structural members without rigid insulating spacers.

5. *Metal Roof with Thermal Blocks* - metal building roofs where roof insulation is draped across metal structural members and rigid insulating spacers are used between structural members and metal roofing. Because the thermal performance of metal building components is sensitive to assembly and fastener details, you may find it advantageous to enter these assemblies using the *Other* category and U-factors from manufacturers' literature.

6. *Other* - roof assemblies that do not fit in one of the above five categories (see **Assembly U-Factor** under Roof Software Inputs).

Roof Software Inputs

Gross Area or Perimeter

Enter the gross area of the roof component in the *Gross Area or Perimeter* field. The gross roof area includes the area of all skylights that penetrate the roof. Skylights are shown below the roof to which they belong on the tree control on the left side of the *Envelope* screen. To change the linkage of a skylight to a roof assembly, drag the

skylight label on the tree to a new roof label and release the mouse. The roof area should be measured along the insulated boundary between conditioned and unconditioned space (e.g., along sloping rafters if the roof insulation follows the slope of the roof).

Cavity Insulation R-Value

Enter the R-value of any insulation to be installed in the cavities between roof structural members. All R-values should be rated R-values for insulation materials only. These values are commonly printed on the materials. The insulating values of other parts of the building assemblies (e.g., ceilings and air films) are already accounted for by the software based on assembly type.

Continuous Insulation R-Value

Enter the R-value of any continuous roof insulation. Continuous insulation is insulation that runs continuously over structural members and is free of significant thermal bridging; one example is rigid foam insulation above the roof deck. All R-values should be rated R-values for insulation materials. The insulating values of other parts of the building assemblies (e.g., ceilings and air films) are already accounted for by the software based on assembly type.

Assembly U-Factor

If you have selected the *Other* roof type, enter the overall U-factor of the roof assembly, including exterior and interior air films. Do not include the finished ceiling in the U-factor calculation if the space between ceiling and roof structure is used as an HVAC plenum. Building departments may require supporting documentation for assemblies entered using the *Other* roof category and *U-Factor* field.

Exterior Walls

Select the *Ext. Wall* button to add an exterior above-grade wall to the description of your design on the *Envelope* screen. Each unique above-grade wall assembly should be entered as a separate component, but multiple wall elements sharing the same construction and orientation (if used) may be entered as one component with appropriate total area.

Exterior and Interior Wall Types

- *Wood Frame, Any Spacing* - wood frame walls of any stud depth or spacing. The category is intended primarily for lightweight walls but may also be used for walls with masonry veneers.

- *Metal Frame, 16" o.c.* - metal frame (stud) walls of any gauge or depth, spaced 16" o.c. The category is intended primarily for lightweight walls but may also be used for walls with masonry veneers.

- *Metal Frame, 24" o.c.* - metal frame (stud) walls of any gauge or depth, spaced 24" o.c. The category is intended primarily for lightweight walls but may also be used for walls with masonry veneers.

- *Metal Wall Without Thermal Blocks* - metal building walls where wall insulation is draped across metal structural members and metal siding is attached directly to the structural members without rigid insulating spacers.

- *Structural Masonry Walls* - a wall construction category used with masonry, precast, and poured-in-place concrete, and concrete masonry units. You can select from six specific types of masonry wall.

- Solid Concrete or Masonry <= 8" - solid precast or poured-in-place concrete, as well as concrete masonry units with grouted cells and actual thickness of 8" or less.

- Solid Concrete or Masonry >8" - solid precast or poured-in-place concrete, as well as concrete masonry units with grouted cells and actual thickness greater than 8".

- CMU <= 8" with Empty Cells - concrete masonry units (CMUs) with at least 50% of the CMU cells free of grout and actual thickness of 8" or less.

- CMU >8" with Empty Cells - CMUs with at least 50% of the CMU cells free of grout and actual thickness greater than 8".

- CMU <= 8" with Integral Insulation - CMUs with integral insulation (e.g., perlite or rigid insulation inserts within the cells of the concrete masonry units) and actual thickness of 8" or less.

- CMU >8" with Integral Insulation - CMUs with integral insulation (e.g., perlite or rigid insulation inserts within the cells of the concrete masonry units) and actual thickness greater than 8".

- *Other* - wall assemblies that do not fit in any of the other above-grade wall categories. You may also use the *Other* category if specific features of your wall give it a significantly lower U-factor than the corresponding generic wall type listed in the menu. See **Assembly U-Factor** under Exterior and Interior Wall Software Inputs.

Warning Note for Integral Insulation

Integral Insulation means insulation placed within the voids of CMUs. Selecting this wall type automatically gives you credit for integral insulation. Loose-fill insulation, such as perlite or rigid foam inserts are typically used. The *CMU with Integral Insulation* wall types assume loose-fill insulation. For walls with better performing integral insulation, use the *Other* wall category.

Do not enter values for *Cavity R-Value* and *Continuous R-Value* unless you have additional insulation attached to this CMU wall assembly. Alternatively, you may enter CMU walls using the *Other* wall type, but be prepared to provide supporting documentation for the U-factor that you are required to enter.

Do not confuse this Integral Insulation discussion with the "Integral" insulation position input available in ASHRAE's ENVSTD program. COM*check-EZ* does not provide an insulation position input but instead assumes an "integral" position for any insulation in above-grade exterior walls, as opposed to assuming the insulation is either on the interior or exterior of the wall. This fixed assumption provides the most generous assessment of the benefits of high heat-capacity walls that would have been available if COM*check-EZ* included a user-input for insulation position.

Exterior and Interior Wall Software Inputs

Gross Area or Perimeter

Enter the gross area of the wall component in the *Gross Area or Perimeter* field. The gross wall area includes the area of all windows and doors that penetrate the wall. Windows and doors appear below the wall to which they belong on the left side of the *Envelope* screen. To change the linkage of a window or door to a wall, drag the window or door label on the tree to the wall label and release the mouse. For interior walls, ignore all window and door assemblies that penetrate the wall.

Cavity Insulation R-Value

Enter the R-value of any insulation to be installed in the cavities between above-grade wall structural members. All R-values should be rated R-values for insulation materials, which are commonly printed on the materials. The insulating values of other parts of the building assemblies (e.g., gypsum board and air films) are already accounted for by the software based on assembly type.

Continuous Insulation R-Value

Enter the R-value of any continuous insulation in the above-grade wall. Continuous insulation is insulation that is continuous over framing members or furring strips and is free of significant thermal bridging. All R-values should be rated R-values for insulation materials. The insulating values of other parts of the building assemblies (e.g., gypsum board and air films) are already accounted for by the software based on assembly type.

Assembly U-Factor

If you have selected the *Other* wall type option, enter the overall U-factor of the above-grade wall assembly, including exterior and interior air films. Building departments may require supporting documentation for assemblies entered using the *Other* wall category and *U-Factor* field.

Furring Type

The *Furring* input field is displayed in the *Construction Details* column for structural masonry above-grade walls. The furring input enables you to specify the type of furring material (if any) used on the wall. If the wall has no furring, select *None*. If the wall assembly employs metallic furring strips, clips, or framing members, select *Metal*; otherwise, select *Wood*.

The furring material is assumed to create some thermal bridging of the insulation in the cavity between furring members, thereby reducing insulation effectiveness.

Heat Capacity

The *Heat Capacity* column is only displayed if an exterior wall or basement wall is created and the *Other* assembly type is selected. Heat capacity is the amount of heat (measured in Btus) necessary to raise the temperature of 1 ft^2 of wall 1°F. Allowable values are 1 to 25 Btu/(ft^2 °F), although no additional credit is given for heat capacity values greater than 21.

Example heat capacities for common wall constructions are shown below:

Wall Description	Heat Capacity
Typical wood- or steel-framed wall	2
2" brick face/framed wall	5
4" brick/framed wall	9
8" block w/empty cores	11
6" concrete wall	14
8" block w/solid-filled cores	16
12" block	15-18
Solid concrete/masonry wall greater than 8" thick	18-25

To precisely calculate the heat capacity of a wall assembly, sum the products of the thickness, density, and specific heat of each material layer. These properties for many common building materials can be found in Chapter 24 of the *1997 ASHRAE Handbook*

of Fundamentals. Because the specific heats of most building materials average around 0.2 Btu/(lb/°F), a good approximation of heat capacity for any wall assembly can be determined by estimating the weight per square foot of exterior wall surface and dividing by 5.

All COM*check-EZ* compliance calculations assume that any insulation in an above-grade exterior wall (or above-grade portion of a below-grade wall assembly) is integral with the thermal mass of the wall, as opposed to assuming the insulation is either on the exterior or the interior of the wall. This fixed assumption provides the most generous assessment of the benefits of high heat-capacity walls that would have been available had COM*check-EZ* included an insulation position input.

Interior Walls

Select the *Int. Wall* button to add an interior above-grade wall to the description of your design on the *Envelope* screen. Enter only interior walls separating conditioned from unconditioned space; ignore all other interior walls. Wall types for interior walls are the same as the wall types for exterior walls. The software inputs are also the same.

Basement Walls

The basement wall component is intended for use with walls that are either partially or fully below grade. Ignore portions of basement walls more than 10 ft below grade. The COM*check-EZ* software automatically treats above-grade portions of basement wall components like above-grade exterior walls.

Select the *Basement* button to add a basement wall component to the description of your design on the *Envelope* screen. Enter each unique basement wall assembly as a separate component. You can enter multiple basement wall elements sharing the same construction as one component with the appropriate total area.

Basement Wall Types

- *Solid Concrete or Masonry <= 8"* - poured-in-place concrete walls and concrete masonry units with grouted cells and actual thickness of 8" or less.

- *Solid Concrete or Masonry >8"* - poured-in-place concrete walls and concrete masonry units with grouted cells and actual thickness greater than 8".

- *CMU <= 8" with Empty Cells* - concrete masonry units with at least 50% of CMU cells free of grout and actual thickness of 8" or less.

- *CMU >8" with Empty Cells* - concrete masonry units with at least 50% of CMU cells free of grout and actual thickness greater than 8".

- *CMU <= 8" with Integral Insulation* - concrete masonry units with integral insulation (e.g., perlite or rigid insulation inserts within the cells of the concrete masonry units) and actual thickness of 8" or less.

- *CMU >8" with Integral Insulation* - concrete masonry units with integral insulation and actual thickness greater than 8".

- *Other* - wall assemblies that do not fit into any of the other basement wall categories. You may also use the *Other* category if specific features of your wall give it a significantly lower U-factor than the corresponding generic basement wall type listed in the menu. See **Assembly U-Factor** under Basement Wall Software Inputs.

Warning Note for Integral Insulation

Integral Insulation means insulation placed within the voids CMUs. Selecting this wall type automatically gives you credit for integral insulation. Loose-fill insulation, such as perlite or rigid foam inserts are typically used. The *CMU with Integral Insulation* wall types assume loose-fill insulation. For walls with better performing integral insulation, use the *Other* wall category. Alternatively, you may enter CMU walls using the *Other* wall type, but be prepared to provide supporting documentation for the U-factor that you are required to enter.

Basement Wall Software Inputs

Gross Area or Perimeter

Enter the gross area of the basement wall component in the *Gross Area or Perimeter* column. The gross wall area includes the area of both above-grade and below-grade portions of the basement wall, and all windows and doors that penetrate the wall. Windows and doors appear below the wall to which they belong on the tree on the left side of the *Envelope* screen. To change the linkage of a window or door to a basement wall, drag the window or door label on the tree to the basement wall label and release the mouse.

Windows and Doors in Basement Walls

When windows and doors are added to basement walls, net opaque wall areas are determined by subtracting windows and doors from any above-grade part of the basement wall. If necessary, the above-grade portion of the basement wall is increased so that windows and doors belong to the above-grade part of the basement wall. See *Wall Height* and *Depth Below Grade* Help topics for an explanation of how basement walls are treated with respect to being above or below grade.

Cavity Insulation R-Value

Enter the R-value of any insulation to be installed in the cavities between furring strips. All R-values should be rated R-values for insulation materials, which are commonly printed on the materials. The insulating values of other parts of the building assemblies (e.g., masonry and air films) are already accounted for by the software based on assembly type.

Continuous Insulation R-Value

Enter the R-value of any continuous insulation to be installed either on the inside or the outside of the basement wall. Continuous insulation is insulation that runs continuously and is free of significant thermal bridging. All R-values should be rated R-values for insulation materials. The insulating values of other parts of the building assemblies (e.g., masonry and air films) are already accounted for by the software based on assembly type.

Assembly U-Factor

If you have selected the *Other* basement wall type option, you must enter the overall U-factor of the basement wall assembly, including the interior air film but excluding the effects of earth and exterior air films. Building departments may require supporting documentation for assemblies entered using the *Other* basement wall category and *U-Factor* field.

Wall Height

Enter the average height of the basement wall measured from the top of the basement floor to the top of the basement wall.

The *Wall Height (ft)* and *Depth B.G. (ft)* fields together enable you to enter a basement wall assembly partially above and partially below grade as a single entry. If the values in these two fields are the same, the wall will be treated as entirely below grade.

Depth Below Grade

Enter the average depth below grade of the wall in the *Depth B.G. (ft)* field, measuring from the average grade level to the top of the basement floor.

Furring Type

The *Furring* input field (under *Construction Details*) enables you to specify the type of furring material (if any) used on the wall. If the wall has no furring, select *None*. If the wall assembly employs metallic furring strips, clips, or framing members, select *Metal*; otherwise, select *Wood*.

The furring material is assumed to create some thermal bridging of the insulation in the cavity between furring members, thereby reducing insulation effectiveness.

Entering Assemblies by Orientation

The software allows you to enter building components with or without considering the component orientation (north, south, east, and west). Initially, the orientation option is turned off. If you prefer to enter components based on their orientation, select the *Orientation* option under the *Options* menu. The compliance calculation will not be based on orientation-specific components until an orientation has been assigned to each exterior wall, window, door, and basement wall component.

If the orientation feature is not being used, you can group and list like components as a single component. However, if you need more than one entry of the same component (e.g. where two assemblies of the same type have different insulation levels), you must create as many additional components as required.

Daylight Control Factor

See *Daylight Control Factor* under *Options Menu*.

Doors

Select the *Door* button to add a door component to the description of your design on the *Envelope* screen. Enter each unique door assembly as a separate component. You can enter multiple door elements sharing the same characteristics as one component with the appropriate total area.

The *Door* button is intended for use with most types of commercial doors. Sliding-glass doors and atrium doors that function primarily as windows rather than to accommodate circulation (e.g., in multifamily or hotel/motel) should be entered using the *Window* button and not the *Door* button. Doors located in exterior walls and the walls of conditioned basements should be included, but areas of doors separating conditioned from unconditioned space should be included in the areas of the interior walls which they penetrate.

Door Types

- *Opaque* - exterior doors that are mostly opaque (i.e., glass covers less than half of the door's area) and are intended to accommodate occupant circulation.

- *Glass* - exterior doors that are mostly glazed (i.e., glass covers more than half of the door's area) and are intended to accommodate occupant circulation.

- *Overhead* - any large exterior doors designed to accommodate large objects and/or vehicular circulation.

- *Air Lock Entry* - exterior doors arranged in pairs to limit infiltration associated with occupant circulation.

- *Revolving* - revolving exterior doors such as those frequently used in hotels and large retail establishments.

- *Other* - any exterior doors that do not fit in any of the other five door categories. You must enter a U-factor and you should be prepared to provide the building department with manufacturers' literature or documentation of U-factor calculations.

Door Software Inputs

Gross Area or Perimeter

Enter the total area of the door in square feet, including any glazed portions. The rough opening for the door is an acceptable proxy for this door area.

U-Factor

Enter the overall U-factor for the door(s) from manufacturers' literature or select the *Use Typical* option from the pop-up context menu accessed by clicking the right mouse button in the *U-Factor* field. The *Use Typical* option provides a U-factor for a door judged typical of the selected type containing little or no thermal insulation.

Daylight Control Factor

See *Daylight Control Factor* under *Options Menu*.

Windows

Windows are defined as any transparent or translucent section in an exterior building wall, including sliding-glass doors, patio doors, and glass blocks but excluding glass entry doors (which are entered using the *Door* button). Windows include glazing material (which may be glass or plastic), framing (mullions, muntins, and dividers), external shading devices, internal shading devices, and integral (between glass) shading devices. Glazing having a slope greater than 60 degrees from horizontal is considered a window, while glazing having a slope less than 60 degrees from horizontal is considered a skylight.

Select the *Window* button to add a window component to the description of your design on the *Envelope* screen. Enter each unique window assembly as a separate component. You can enter multiple window elements having the same characteristics as one component with an appropriate total area.

Window Software Inputs

The software prompts you to enter three window characteristics each time you create a window component–frame type and glazing layers are entered in the *Assembly* column, and glazing type is entered under the *Construction Details* column. Specifying these window characteristics is helpful for inspection purposes and enables the software to provide typical performance characteristics (i.e., U-factor, SHGC, and VLT) for various glazing options.

Gross Area or Perimeter

Enter the area of the entire window component in square feet measured parallel to the window surface, including both glazed materials and frame. The rough window opening provides an acceptable proxy for this window area.

Frame Type and Glazing Layers

The frame type and glazing layers are selected from a pop-up list accessed by clicking the left mouse button in the *Assembly* field. The frame type enables you to identify the window frame material and hence characterize the thermal conductivity of the frame. For frame materials not listed, use the frame type that is thermally most similar; e.g., use *Wood* for metal-clad wood windows. The glazing layers enables you to identify the number of glazing layers in the windows (i.e., single, double, or triple). *Low-E* coatings are included in the list because the performance impact of low-emissivity films is similar to that of additional glass layers.

Glazing Type

The *Glazing* field (under *Construction Details*) enables you to identify the type of glass in the window (i.e., clear, tinted, or reflective). Use *Reflective* if the glass has a reflective surface, even if the glass is also tinted.

U-Factor

Window U-factor is based on the entire assembly, including both glazing and frame. Center-of-glass U-factors cannot be used. Glazing U-factors must be tested and documented by the manufacturer in accordance with the National Fenestration Rating Council (NFRC) test procedure. The COM*check-EZ* software includes a feature that enables you to insert a typical U-factor for the window characteristics you have selected. To access this feature, click the right mouse button on the U-factor input field and select *Use Typical*. The *Use Typical* feature provides values you can use in preliminary evaluations before selecting actual products. However, the actual ratings of products in the building must meet or exceed (i.e., be no higher than) the values you assume in the compliance analysis. Most products on the market will meet or exceed the performance levels provided by the *Use Typical* feature.
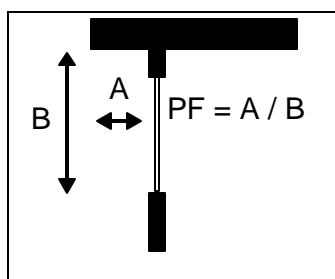
Solar Heat Gain Coefficient

The Solar Heat Gain Coefficient (SHGC) specifies the glazing's effectiveness in rejecting solar heat gain. SHGC is part of a system for rating window performance used by the NFRC. SHGC is gradually replacing the older index, shading coefficient (SC), in product literature and design standards. If you are using glass whose performance is listed in terms of SC, you may convert to SHGC by multiplying the SC value by 0.87.

SHGCs must be tested and documented by the manufacturer in accordance with the NFRC test procedure.

Projection Factor

The projection factor enables you to characterize the shading impact of horizontal overhangs or canopies that project outward from the plane of the window. The projection factor is the ratio of the distance the overhang projects from the window surface to its height above the sill of the window it shades. The software accepts values from 0.0 to 1.0.

Projection Factor

Daylight Control Factor

See *Daylight Control Factor* under *Options Menu*.

Visible Light Transmittance

See *Visible Light Transmittance* under *Options Menu*.

Skylights

Skylights are defined as any transparent or translucent section in a building roof, which include glazing material (glass or plastic), frame, and curb. Glazing having a slope less than 60 degrees from horizontal is considered a skylight, while glazing having a slope greater than 60 degrees from horizontal is considered a window.

Select the *Skylight* button to add a skylight component to the description of your design on the *Envelope* screen. Enter each unique skylight assembly as a separate component. You can enter multiple skylight elements having the same characteristics as one component with the appropriate total area.

Skylight Software Inputs

The software prompts you to enter three skylight characteristics each time you create a skylight component–frame type and glazing layers are entered in the *Assembly* column, and glazing type is entered under the *Construction Details* column. Specifying these skylight characteristics is helpful for inspection purposes and enables the software to provide typical performance characteristics (i.e., U-factor and SHGC) for various glazing options.

Gross Area or Perimeter

Enter the area of the entire skylight component in square feet measured parallel to the skylight surface, including both the glazing material and frame. The rough skylight opening provides an acceptable proxy for this skylight area.

Frame Type and Glazing Layers

The frame type and glazing layers are selected from a pop-up list accessed by clicking the left mouse button in the *Assembly* field. For frame materials not listed, use the frame type that is thermally most similar; e.g., use *Wood* for metal-clad wood skylights. The glazing layers field enables you to identify the number of glazing layers in the skylight (i.e., single, double, or triple). *Low-E* coatings are included in the list because the performance impact of low-emissivity films is similar to that of additional glass layers.

Glazing Type

The *Glazing* field (under *Construction Details*) enables you to identify the type of glass in the skylight (i.e., clear, tinted, or reflective). Use *Reflective* if the glass has a reflective surface, even if the glass is also tinted.

U-Factor

Skylight U-factor is based on the entire assembly, including glazing, sash, curbing, and other framing elements. Center-of-glass U-factors cannot be used.

U-factors for skylights must be tested and documented by the manufacturer in accordance with the NFRC test procedure. If an NFRC U-factor rating is available for your skylight, you should use its BB-Size rating (i.e., 48 by 48 in.).

The COM*check-EZ* program includes a feature that enables you to insert a typical U-factor for the skylight characteristics you have selected. To access this feature, click the right mouse button on the U-factor input field and select *Use Typical*. The *Use Typical* feature provides values you can use in preliminary evaluations before selecting

actual products. However, the actual ratings of products put in place in the building must meet or exceed (i.e., be no higher than) the values you assume in the compliance analysis. Most products on the market will meet or exceed the performance levels provided by the *Use Typical* feature.

Floors

Select the *Floor* button to add a floor component to the description of your design on the *Envelope* screen. Enter each unique exposed floor assembly as a separate component. You can enter multiple floor elements sharing the same construction as one component with the appropriate total area.

The *Floor* button is used to enter floors over unconditioned space, including floors exposed to exterior conditions, floors over crawl spaces, and floors over unconditioned parking garages. Interior floors that do not separate conditioned from unconditioned space are not included. Concrete slabs on grade are entered separately using the *Slab* button.

Floor Types

- *All-Wood Joist/Truss* - any structural wood floor in which insulation is placed between the structural members; e.g., batt insulation between wood floor joists.

- *Nonwood Joist/Truss* - any floor in which insulation is placed between nonwood structural members; e.g., batt insulation between steel bar joists or trusses with metal webs.

- *Structural Slab* - any floor structure in which floor is insulated primarily or exclusively using continuous-rigid or spray-on insulation.

- *Other* - floor assemblies that do not fit in any of the other three categories. See **Assembly U-Factor** under Floor Software Inputs.

Floor Software Inputs

Gross Area or Perimeter

Enter the gross area of the floor (in square feet) along the boundary where it separates conditioned from unconditioned space.

Cavity Insulation R-Value

Enter the R-value of any insulation to be installed in the cavities between floor structural members. All R-values should be rated R-values for insulation materials, which are commonly printed on the materials. The insulating values of other parts of the building assemblies (e.g., subfloor and air films) are already accounted for by the software.

Continuous Insulation R-Value

Enter the R-value of any continuous floor insulation. Continuous insulation is insulation that runs continuously over structural members and is free of significant thermal bridging. All R-values should be rated R-values for insulation materials. The insulating values of other parts of the building assemblies (e.g., subfloor and air films) are already accounted for by the software.

Assembly U-Factor

If you have selected the *Other* floor type option, you must enter the overall U-factor of the floor assembly, including exterior and interior air films. Building departments may

require supporting documentation for assemblies entered using the *Other* floor category and *U-Factor* field.

On-Grade Slabs

Slab-on-grade components include all concrete slabs whose perimeters are exposed to exterior conditions. Ignore slabs more than 2 ft below grade. Enter all exposed floors, including overhanging floors exposed to exterior conditions, floors over crawl spaces, and floors over unconditioned parking garages, as floor components rather than slab components.

Select the *Slab* button to add a concrete slab component to the description of your design on the *Envelope* screen. Enter each unique concrete slab/insulation combination (i.e., insulation R-value, position, and depth) separately. You can enter all slabs sharing the same insulation method as a single component with the appropriate total perimeter length.

Slab-on-Grade Software Inputs

Perimeter

Enter the perimeter of the on-grade slab component in linear feet in the *Gross Area or Perimeter* field.

Slab Type and Insulation Position

The slab type and insulation position are selected from a pop-up list accessed by clicking the left mouse button in the *Assembly* field. The slab type enables you to specify whether the concrete slab is heated or unheated. A heated slab (e.g., radiant slab) is one designed as part of a space-conditioning system for transmitting heating into the space. Heated slabs have higher insulation requirements than unheated slabs under the code.

The insulation position pop-up list enables you to specify if perimeter slab insulation will be used and, if so, if it will be placed vertically or horizontally. If no perimeter insulation will be used, select *No Insulation*.

Continuous Insulation R-Value

Enter the R-value of the slab perimeter insulation. If *No Insulation* has been selected from the *Assembly* pop-up list, the Cavity R-Value field will be disabled (gray).

Insulation Depth

The *Insul. Depth* field (under *Construction Details*) enables you to specify the depth of the insulation. If the insulation is placed vertically, insulation depth is measured from the top of the slab downward. If placed horizontally, insulation depth is the vertical distance from the top of the slab downward to the bottom slab, and then horizontally underneath the slab. Five options are available for horizontal insulation depth: *1'*, *2'*, *3'*, *4'*, and *Continuous*. Select *Continuous* if the insulation will run under the entire slab. Five options are also available for vertical insulation depth: *1'*, *2'*, *3'*, *4'*, and *>4'*. Where slab insulation is required, it must fully insulate the slab edge and extend from the top of the slab to the depth you select.

Lighting Screen

Use the blue-on-white buttons at the top of the *Lighting* screen to create a list of lighting fixtures present in your proposed design. Each fixture type you select is added to the lighting fixtures list displayed on the *Lighting* screen. For each fixture type, you must enter a ballast type (if applicable), the number of lamps per fixture, quantity, and the

fixture input wattage. Input wattage is the electrical power input to the lamp and ballast combination.

After entering complete information for each new fixture, the software automatically updates the compliance results. The results are displayed at the bottom of the screen in the *Lighting:* box. If *TBD* (to be determined) is displayed in this field, you most likely have not yet filled in the fixture wattage or quantity for one or more components. To determine which data are missing or invalid, look for fields with red-on-white text. In addition to providing inputs for all red-on-white fields, you must select at least one building use type and its corresponding area on the *Project* screen before the software can determine compliance.

Optional features available on the *Lighting* screen may be selected from the ***Options*** menu: Spaces (Lighting) and Exemptions and Allowances (Lighting).

T8/T12 Fluorescent

Select the *T8 / T12 Fluorescent* button to add fixtures using T8, T10, or T12 tubes to your list of fixtures on the *Lighting* screen.

Because of space limitations, lighting types are shown on the menus and main screen using abbreviations. For example, 48" T12 ES 34W stands for a fixture using 48" T-12 energy-saving fluorescent lamps rated at 34 watts each. The following abbreviations are used in these descriptions:

- ES – energy saving, a designation that usually indicates the lamp will draw 10% to 15% less power than a standard lamp of the same type
- Slim – slimline, a type of fluorescent lamp that uses single-pin contacts rather than the normal two-pin contacts
- T8 – a designation for tubular fluorescent lamps that are 1" in diameter
- T10 – a designation for tubular fluorescent lamps that are 1-1/4" in diameter
- T12 – a designation for tubular fluorescent lamps that are 1-1/2" in diameter
- U – U-shaped lamps
- W – nominal lamp wattage.

Compact Fluorescent

Select the *Compact Fluor.* button to add compact fluorescent fixtures to your list of fixtures on the *Lighting* screen.

Because of space limitations, lighting types are shown on the menus and main screen using abbreviations. For example, Twin Tube 13W stands for a fixture using compact fluorescent lamps rated at 13 watts each. The following abbreviations are used in the descriptions:

- Twin, Triple, Quad – designation referring to the number of fluorescent tubes projecting from the lamp (i.e., two, three, or four)
- 2-pin, 4-pin – designation referring to the number of contacts at the base of the lamp
- W – nominal lamp wattage.

HID

Select the *HID* button to add fixtures using high-intensity discharge (HID) lamps to your list of fixtures on the *Lighting* screen.

Incandescent

Select the *Incandescent* button to add fixtures using incandescent lamps to your list of fixtures on the *Lighting* screen.

Spaces

The *Lighting* screen contains an optional feature that enables you to organize lighting fixtures under the spaces (or parts of the building) in which they are used. To activate this feature, select *Spaces* from the *Options* menu while in the *Lighting* screen. This feature helps ensure fixture counts are correct and greatly facilitates plan review and inspections.

To add spaces to your list of lighting fixtures on the *Lighting* screen, click on the blue-on-white *Add Space* button (to the right of the fixture type buttons) at the top of the *Lighting* screen. A new line will be entered on the main portion of the *Lighting* screen and a new space label will appear in the tree control at the left of the screen. Fixtures listed below each space "belong" to that space and are listed that way on the compliance report. You can change the space name from the default name given by the software, which appears in the left-most table column. To reorganize fixtures under these space names, simply drag the fixture labels on the tree control.

Lighting Screen Inputs

Fixture ID

The *Fixture ID* field shows the fixture ID you have entered. You can associate the fixture with a fixture type designation used on the lighting fixture schedule and elsewhere in the construction documents; e.g., F1 for fixture type 1. *Fixture ID* is an optional field that you may leave blank, but it is recommended as it enables fixtures to be clearly defined.

Fixture Description

The *Fixture Description* field is for descriptions of fixtures that you enter. *Fixture Description* is an optional field that you may leave blank. However, fixture descriptions can help you keep track of the fixtures in the list, avoid errors and oversights, and facilitate plan review and inspections because this information is included on the compliance report. Fixture descriptions may include manufacturer and part number, dimensions (e.g., 2x4), mounting type (e.g., recessed, surface, suspended), or other distinguishing characteristics.

Lamp Description/Wattage Per Lamp

Click the left mouse button in the *Lamp Description/Wattage Per Lamp* field to select from a pop-up list of available lamp types. The pop-up list contains the most commonly used lamp and ballast combinations. Select *Other* if the lamp type you intend to use does not match one of the listed types. The *Lamp Description/Wattage Per Lamp* is not a user-editable field unless you have selected *Other* from the pop-up list.

Ballast

The ballast type is entered by selecting from a pop-up list. (Incandescent fixtures do not require a ballast entry). Available ballast types are magnetic and electronic, and hybrid.

The following definitions have been used in determining default input wattages. You should use these definitions in describing the ballast type in the fixtures you intend to use.

- Magnetic – contains conventional capacitor, rectifier, and/or transformer components (core and coil), and operates at a 60 Hz frequency.

- Electronic – contains advanced electronic components and no (or very small) core and coil transformers, and operates at high frequency-typically 20,000 Hz or more.

- Hybrid – may contain both conventional components and electronic circuitry. Use *hybrid* for any ballast that does not completely fit the definition for either magnetic ballasts or electronic ballasts.

Lamps Per Fixture

The *Lamps Per Fixture* is entered by selecting from a pop-up list.

Fixture Wattage

You can enter the fixture wattage directly or have the software provide a typical wattage for that fixture. To input a typical wattage, click the right mouse button in the *Fixture Wattage* field to display the pop-up context menu. The software will provide a typical input wattage for the fixture. Not all possible lamp and ballast combinations are included-only those for which adequate data were available. No values are provided for fixtures with hybrid ballasts, because the category includes equipment of highly variable design. If the *Use Typical* option is gray, a typical wattage is not available. Input wattage is the related electrical power input to the lamp and ballast combination.

You may either use the typical input wattage provided by the software or override it with a value based on the equipment you intend to install. In either case, you should be prepared to provide supporting documentation based on manufacturer's literature to the building department.

Mechanical Screen

Use the blue-on-white buttons at the top of the *Mechanical* screen to enter characteristics of HVAC system, plant, and water-heating components in your proposed design. Because most requirements in the mechanical section of the energy code are mandatory, the *Mechanical* section of the software works somewhat differently from the *Envelope* and *Lighting* sections. Rather than generating a numerical compliance index, the *Mechanical* section generates a customized list of mandatory requirements applicable to the mechanical components you identify.

Click the *Plant* button or *Water Heating* button to display a single screen on which you enter information about these components. Click the *HVAC System* button to launch a series of screens (collectively referred to as a wizard) on which you enter information about your building's HVAC components. The HVAC system wizard screen sequences depend on the information you enter. You must continue to the final screen in the sequence before the *Finish* button becomes active, enabling you to return to the *Mechanical* screen.

After you click the *Finish* button on any of the screens, the software supplies a default component name (in the left-hand screen), along with a corresponding quantity and description (in the right-hand screen) for the component you defined. You can edit the default component description or quantity by simply clicking on the appropriate field and typing a new description or quantity. For clarity and consistency with building plans, it may also be helpful to edit the tree labels in the left-hand screen. To change these default names, double-click on the name in the left-hand screen to bring up an edit box for the

text. Alternatively, you can right-click on the name to display a pop-up list (called a context menu) and select *Edit Text* from this menu. Selecting *Edit System Inputs, Edit Plant Inputs, or Edit SWH Inputs* from the context menu enables you to redisplay the input screens for the given component and to redefine the component inputs. You may also delete (cut), copy and paste, or duplicate components by selecting the corresponding option from the context menu. For more information on context menus, refer to the Help section *Context Menu*.

Viewing Mechanical Requirements

To view the requirements that apply to a mechanical component, select the component, then go to the *View* menu and click the *Requirements List* or *Inspection Checklist* option. The *Requirements List* option displays a comprehensive description of requirements applicable to the selected component. The *Inspection Checklist* option displays the same requirements, but in an abbreviated (checklist) format. You can use the *View* menu to toggle the display back to the list of mechanical components or to the detailed or concise list of requirements. The output report will contain all three views: the list of your selected mechanical components, the checklist of requirements, and the more detailed description of these same requirements.
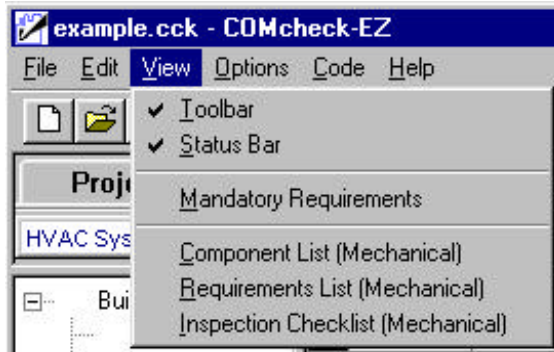
View Menu - Mechanical

While in the *Requirements List* or *Inspection Checklist* view, click the *Building* label on the left-hand screen to display mechanical requirements that apply to all applicable building systems, independent of particular components selected. Even though these requirements apply to all applicable systems, the same list of requirements may not always be displayed. For example, there are duct insulation and construction requirements that apply to all systems that have ducts. Rather than repeat these same requirements for each ducted system in the building, the requirements are printed once as generic requirements and are displayed when the *Building* label is selected. However, if you have not selected any systems having ducts, the requirements will not be displayed. Other requirements will always appear. You can also find a description of the generic requirements by selecting *Mandatory Requirements* from the *View* menu.

To view an example description of mechanical components, load the EXAMPLE file from the *File* menu and click the *Mechanical* screen. To view the Mechanical Compliance Report from within the software, select *Print Preview* from the *File* menu. The checklist portion of the compliance report is intended for use by building department staff during plan review and site inspection to ensure that applicable requirements have been met.

HVAC System Screens

The *HVAC System* button launches a sequence of screens to help you identify key characteristics of the HVAC systems in your building. The term HVAC systems refers to secondary HVAC systems, including controls, fans, terminal boxes, radiators, coils, and package HVAC equipment, not primary HVAC system components such as boilers, chillers, cooling towers, and pumps. The characteristics you select determine which requirements apply.

The HVAC System screens enable you to describe the HVAC system features in your building in sufficient detail to exclude large numbers of requirements that do not apply to your systems. The resulting simplification facilitates both designing for compliance with the code and code enforcement.

Round buttons (radio buttons) permit only one selection from each group, square boxes (checkboxes) permit multiple selections from a group of inputs, and gray text indicates that the option is unavailable because it is incompatible with other selection(s) that have been made on the current or a previous screen.

When multiple different HVAC systems are used within a single building, you may select the *HVAC System* button multiple times to enter more than one system. When multiple identical (or nearly identical) systems are used, describe them once and use the quantity field to indicate the number of such systems present.

Equipment Type Selection Screen

The *Equipment Type Selection* screen is the first in a series of screens that enable you to enter characteristics of the HVAC system(s) in your proposed design. Select the *Heating Equipment Type*, *Cooling Equipment Type,* and *Zoning Category* for the system(s) you are entering.

Note that some of the input fields are interdependent. If you select *Heat Pump* as the *Heating Equipment Type*, you will not be able to select a *Cooling Equipment Type* because it is assumed to be DX (direct expansion). If you select *Unit Heater* for *Heating Equipment Type* or *Packaged Terminal DX Unit* for *Cooling Equipment Type*, you will not be able to select *Multiple-Zone* or check the *Perimeter System* box under *Zoning Category* because these equipment types are not compatible.

After entering all your selections on the *Equipment Type Selection* screen, click the *Next* button to proceed to the next screen and continue describing the mechanical system.

Heating Equipment Type

Central Furnace - A central furnace is a self-contained, indirect-fired or electrically heated furnace supplying heated air through ducts to spaces. A central furnace can be a stand-alone unit, but is typically integral to a rooftop-DX (direct expansion) system or split DX system air conditioner. Though less common, a central furnace may also contain a hydronic coil that would be used for air conditioning.

Duct Furnace - A duct furnace is a furnace normally installed in distribution ducts of air-conditioning systems to supply warm air. A duct furnace usually does not have its own supply fan and uses air supplied through the ducts by other supply fans such as a fan for a central air conditioner.

Hydronic or Steam Coil - A hydronic coil is an array of tubing, placed in a supply air stream, through which hot or cold water passes, heating or cooling the supply air stream to provide heating or air conditioning to a space. Hydronic coils, central furnaces, and DX coils are used in various configurations of heating and air-conditioning systems. A

steam coil is an array of tubing, placed in a supply air stream, through which steam passes to provide heat to a space.

Heat Pump - A heat pump is a DX air conditioner with a reversing valve, allowing it to operate in two refrigeration modes. When the refrigeration system is reversed, the heat pump absorbs heat from the outdoor air and rejects it to the indoor environment, providing heat to the space. Heat pumps are manufactured in several configurations, including packaged terminal, rooftop package, split system, water loop, and ground coupled.

Radiant Heater - A radiant heater is a heater that transfers heat to objects and surfaces within the heated space primarily (greater than 50%) by infrared radiation. Radiant heaters can be direct- or indirect-fired with a heating fuel, have electric heating elements, or use hydronic coils or steam coils.

Unit Heater - A unit heater is a self-contained piece of heating equipment that requires connections only to energy sources. Unit heaters are installed in the spaces they are intended to heat and do not use ductwork to distribute heat. They are sometimes controlled in sequence with a separate air conditioner serving the same space. Unit heaters can be direct- or indirect-fired with a heating fuel, have electric heating elements, or use hydronic coils or steam coils.

Cooling Equipment Type

Field Assembled DX System – This type is used for DX systems that are not manufactured (and rated) as single packages but rather are assembled at the building site from separately manufactured components. DX stands for direct expansion cooling. In DX cooling equipment, a refrigerant coil is placed directly in the supply air stream. As the refrigerant evaporates and expands, it removes energy, lowering the temperature of the supply air stream.

Hydronic Coil - A hydronic coil is an array of tubing, placed in a supply air stream, through which hot or cold water passes, heating or cooling the supply air stream to provide heating or air conditioning to a space. Hydronic coils, central furnaces, and DX coils are used in various configurations of heating and air-conditioning systems.

Packaged Terminal DX Unit – A packaged terminal DX air conditioner (PTAC) is a self-contained air-conditioning unit typically installed through a wall. It discharges cool air directly to the space without the use of ducts for distribution. PTACs are often equipped with electric resistance heating elements and sometimes are equipped with hydronic coils or steam coils for heating.

Rooftop Packaged DX Unit – A rooftop packaged DX unit is also known as a unitary single-packaged air conditioner. This unit is a self-contained DX air conditioner, typically installed on the roof of a building using ducts to distribute cool air to the conditioned space. It can be used in single-zone or multiple-zone applications, and can also be equipped with a constant-volume or variable-volume fan. These units are often combined, within the same assembly, with a central furnace, hydronic coils, or steam coils. Depending on the cooling capacity and climate, rooftop packaged DX units may often be equipped with an air economizer.

Split DX System – A split DX system is also known as a unitary split system air conditioner or split system. It consists of two factory-made assemblies: a condensing unit that uses outside air as the heat sink, and an indoor DX coil with integral supply fan. The indoor unit is often combined, within the same assembly, with a central furnace or hydronic coils or steam coils. Because the indoor unit is usually located a long distance from outside walls, it is difficult to equip a split system with an air economizer.

Zoning Category

Single Zone – A single-zone system serves only one thermostatic control zone. The system is usually controlled by a single thermostatic control, and only maintains comfort conditions for the space where the temperature control is located.

Multiple-Zone – A multiple-zone system is designed to meet space-conditioning loads in multiple thermostatic control zones at the same time. Multiple-zone systems usually use a common air distribution system and employ terminal units to vary the flow and temperature of air to meet the differing space-conditioning loads of each zone.

Perimeter System – A perimeter system is designed to offset only envelope heat losses and gains.

Heating Equipment Details Screen

The *Heating Equipment Details* screen is the second in a series of screens that enables you to enter characteristics of the HVAC systems in your proposed design. This screen will appear if you have selected any heating equipment other than *Heat Pump* in the *Equipment Type Selection* screen.

Select the *Fuel Type* or the *Heat Source* for the heating equipment. If you select *Hydronic or Steam Coil* as the *Heating Equipment Type*, all selections for *Fuel Type* will be disabled and you instead must select the *Heat Source* for this equipment. If you select *Central Furnace* or *Duct Furnace*, all selections for *Heat Source* will be disabled. If you select *Radiant Heater* or *Unit Heater*, you may choose from either the *Fuel Type* or *Heat Source* options.

When you have finished your selections on the *Heating Equipment Details* screen, click the *Next* button to proceed to the next screen and continue describing the mechanical system, or click the *Finish* button to accept all of the inputs and return to the *Mechanical* screen. If additional screens must be completed, the *Next* button will be enabled (black text) and the *Finish* button will be disabled (gray text). If there are no additional screens, the *Next* button will be disabled and the *Finish* button will be enabled. You may cancel the sequence of selections you have made at any time by pressing the **Esc** (escape) key.

Heat Pump Details Screen

The *Heat Pump Details* screen will be the second in a series of screens that enable you to enter characteristics of the HVAC systems in your proposed design. This screen will appear if you have selected *Heat Pump* as the *Heating Equipment Type* in the first screen. Select the *Heat Pump Type, Condenser Type* and *Capacity*. Note that *Water-Cooled* is the only condenser option available if *Water Loop Heat Pump* is selected as the *Heat Pump Type*.

When you have finished your selections on the *Heat Pump Details* screen, click the *Next* button to proceed to the next screen or click the *Finish* button to accept all of the inputs and return to the *Mechanical* screen. You may cancel the sequence of selections you have made at any time by pressing the **Esc** (escape) key.

Heat Pump Type

Packaged Terminal Unit – A packaged terminal heat pump (PTHP) is a self-contained heat pump typically installed through a wall. It discharges warm or cool air directly to the space without the use of ducts for distribution.

Rooftop Packaged Unit – A rooftop packaged heat pump is also known as a unitary single-packaged heat pump. This unit is a self-contained heat pump, typically installed on the roof of a building using ducts to distribute cool air to the conditioned space. It can

be used in single-zone and multiple-zone applications, and can also be equipped with a constant-volume or variable-volume fan. Depending on the cooling capacity and climate, rooftop packaged DX units may be equipped with an air economizer.

Split System – A split system heat pump is also known as a unitary split system heat pump. It consists of two factory-made assemblies: a condensing unit that uses outside air as the heat sink (during cooling) and heat source (during heating), and an indoor DX coil with integral supply fan. Because the indoor unit is usually located a long distance from outside walls, it is difficult to equip a split system with an air economizer.

Water Loop Heat Pump – A water loop heat pump is a heat pump with a refrigerant-to-water heat exchanger. During cooling mode, the heat exchanger serves as the condenser, rejecting heat from the refrigerant to the water. During heating, the heat exchanger serves as the evaporator, absorbing heat from the water. The refrigerant-to-water heat exchanger is typically connected to a circulating water loop that also serves many other water loop heat pumps. A boiler and cooling tower maintain the temperature range of the circulating water loop. The boiler turns on when the temperature falls below the set point. The cooling tower turns on when the temperature rises above the set point.

Other – Any type of heat pump, which is not described by one of the types listed above, is classified as *Other*.

Condenser Type

The condenser of an air conditioner is where refrigerant rejects heat absorbed during the process of cooling indoor spaces. As the refrigerant passes through the heat exchanger it rejects heat to the surrounding fluid, usually air or water. If the equipment is a heat pump, the condenser becomes an evaporator during heating mode. As the refrigerant passes through the heat exchanger, it absorbs heat from the surrounding fluid, causing the refrigerant to change from a liquid to a gas (or evaporate).

Air-Cooled – An air-cooled condenser is a refrigerant-to-air heat exchanger exposed to outdoor conditions. As refrigerant passes through the coils of the heat exchanger, heat is rejected to outdoor air (during cooling) and absorbed from outdoor air (during heating).

Evaporatively Cooled – An evaporatively-cooled condenser is similar to an air-cooled condenser with the exception that during cooling, the heat exchanger is sprayed with water, increasing the heat rejection. Heat pumps and air conditioners equipped with evaporatively cooled condensers are typically more efficient than their air-cooled counterparts.

Groundwater Coupled – A groundwater-coupled condenser is similar to a water-cooled condenser except that groundwater will always be the heat source (or sink) for the condenser. As refrigerant passes through the coils of the heat exchanger, heat is rejected to groundwater (during cooling) and absorbed from groundwater (during heating).

Water-Cooled – A water-cooled condenser is a refrigerant-to-water heat exchanger. As refrigerant passes through the coils of the heat exchanger, heat is rejected to the water (during cooling) and absorbed from the water (during heating). Heat pumps with water-cooled condensers are typically connected to a central circulating water loop with other water loop heat pumps.

Capacity

Select the cooling capacity range for the heat pump.

Multiple-Zone Details Screen

The *Multiple-Zone Details* screen will only appear if you have selected *Multiple-Zone* for the *Zoning Category* on the first screen. Select the *Distribution Type, Terminal Unit Type* (if applicable), and *Reheat Type* (if applicable).

Note that some of the input fields are interdependent. If you select *Single Duct* as the *Distribution Type*, you will not be able to select *VAV Mixing Box* or *CV Mixing Box* for *Terminal Unit Type*, because they are only applicable to dual-duct systems. If you select *Three Duct* as the *Distribution Type*, *Terminal Unit Type* options and *Reheat Type* options will be disabled, because they are not applicable to this distribution type.

When you have finished your selections on the *Multiple-Zone Details* screen, click the *Next* button to proceed to the next screen and continue describing the mechanical system.

Distribution Type

Single Duct – Single-duct systems are the most common types of multiple-zone air distribution systems. A single-duct system uses a single fan to supply cool or warm air to zone terminal units. The zone terminal units will then modulate the amount of supply air and sometimes reheat the supply air to meet the specific heating or cooling requirements of the zone. Some systems will recool the supply air, but reheating is more standard practice.

Single Fan, Dual Duct – A single-fan, dual-duct system uses a single fan to supply air through two primary air ducts, supplying cool air and warm air. Air from each of these ducts is then mixed in a terminal unit (VAV mixing box or CV mixing box) and supplied to the zone as a single air stream.

Dual Fan, Dual Duct – A dual-fan, dual-duct system uses two fans to supply air through two primary air ducts, supplying cool air and warm air. One fan serves the warm air duct, and the other serves the cool air duct. Air from each of these ducts is then mixed in a terminal unit (VAV mixing box or CV mixing box) and supplied to the zone as a single air stream.

Three Duct – A three-duct system uses a single fan to supply three primary air ducts, supplying cool air, warm air and return (or neutral) air. A three-duct system is typically constant volume and uses CV mixing boxes to mix warm air and return air or cool air and return air (but never warm and cool air) to meet individual zone loads.

Terminal Unit Type

VAV Box – A standard VAV box includes a damper, a connection to the supply air duct, and sometimes a hydronic or electric resistance reheat coil. Because the zone thermostat calls for less cooling, the damper begins to close and reduce the amount of supply air to the zone. The reheat coil turns on and reheats the supply air only when the damper is at its minimum position. Standard VAV boxes are used in both single-duct and dual-duct systems.

Fan-Powered VAV Box – A fan-powered VAV box typically consists of a fan configured to draw air from a return air plenum, a connection to the supply air duct, dampers to regulate the flow of air from the supply air duct and the flow of air from the plenum to the fan, and a hydronic or electric resistance reheating coil. There are many configurations of fan-powered VAV boxes, but there are only two typical operation sequences: series and parallel.

In series operation, the fan operates continuously, resulting in a constant air supply to the zone. As the zone thermostat calls for less cooling, the dampers modulate to reduce the amount of supply air and increase the amount of plenum air delivered to the zone. The

reheat coil turns on and reheats the supply air only when the damper is at its minimum position.

In parallel operation, the fan does not operate as long as the zone calls for cooling. If the main supply air is reduced to a minimum and the zone still requires heating, the fan will come on, supplying additional warmer plenum air to the zone. If the zone requires additional heating after the fan has come on, the reheat coil is activated.

VAV Mixing Box – A VAV mixing box mixes air from the warm and cool air ducts of a dual-duct system. The operation sequence of a mixing box terminal depends on several other conditions such as if the air economizer is operating or if the building is primarily requiring cooling or heating.

If an air economizer or the mechanical cooling plant is operating, the warm air supply to the zones is shut off by the mixing boxes. The mixing box modulates the flow of cool air to the zone to meet the required space conditioning. When the cool air damper has closed to its minimum position, the mixing box will then modulate open to allow warm air to be mixed with the cool air and simultaneous heating and cooling begins. At some point, the mixing box may completely close the cool air supply to the zone. Care must be taken when controlling mixing boxes to ensure that supply air is never completely shut off to a zone. This would prevent adequate outdoor ventilation air from being supplied to the space.

In some cases an entire building may be in heating mode, beyond what can be met by unheated return air alone. In this case, the mixing boxes will shut off the supply of cool air to the zones. The mixing box modulates the flow of warm air to the zone to meet the required space conditioning. When the warm air damper has shut to its minimum position, the mixing box will modulate open to allow cool air to be mixed with the warm air. Like in the primary cooling mode, the warm air damper may totally close at some point, but supply air to the zone must never be completely shut off.

CV Mixing Box – A CV mixing box (or constant-volume mixing box) mixes necessary amounts of cool air and warm air to maintain space conditions. The amount of cool air or warm air will vary, but the total flow of cool and warm air through a CV mixing box will remain constant. Except under special conditions, the code does not allow the use of CV mixing boxes.

Reheat/Recool Coil – A reheat/recool coil is placed in a branch line to a zone of a building and is usually controlled from a thermostat located in the space the branch is serving. Reheat/recool coils are usually found only in single-duct VAV systems. For example, if a reheat coil is installed in a duct, it would provide heating to a zone if the system were in cooling mode and supplying cool air through the distribution system. Reheat coils can be electric resistance elements, hydronic coils, or steam coils. Recool coils are not very common and are almost always hydronic. (COM*check-EZ* assumes recool coils are hydronic.)

Reheat Type

Electricity – When *Electricity* is used as the reheat type, electric resistance heating elements are installed in the terminal units and are turned on and off by zone thermostatic controls.

Hydronic – Hot water coils are hydronic coils installed in the terminal units. They are equipped with valves, which modulate the flow of hot water, and are controlled by zone thermostatic controls.

Steam – Steam coils, used as a reheat source, are installed in terminal units. They are equipped with valves, which modulate the flow of steam, and are controlled by zone thermostatic controls.

Fan System Details Screen

The *Fan System Details* screen will only appear if you have selected *Multiple-Zone* for the *Zoning Category* on the first screen. Check the applicable boxes under *Fan System Details.* If you select *Supply Fan HP >25 hp* or *Return Fan HP >25 hp*, select the *Fan Variable Flow Control* on your system. If you only select *Supply Static Pressure >3 in. water*, the *Fan Variable Flow Control* options are disabled.

When you have finished your selections on the *Fan System Details* screen, click the *Next* button to proceed to the next screen in the series or click the *Finish* button to accept all of the inputs and return to the *Mechanical* screen. You may cancel the sequence of selections you have made at any time by pressing the **Esc** (escape) key.

Fan System Details

Supply Fan HP >25 hp – The supply fan hp is the horsepower listed on the supply fan motor nameplate. The supply fan is the fan that provides air to the distribution ducts of the mechanical system. Select this option if the listed horsepower is greater than 25 hp.

Supply Static Pressure >3 in. water – Static pressure is the total amount of pressure exerted by the supply or return air stream on the ductwork. In air distribution and return systems, this pressure is measured in inches of water column (in. water). Most large supply air distribution systems and multiple-zone systems operate at static pressures exceeding 3 in. water. Occasionally, static pressure in return air systems exceeds 3 in. water, in which case this option should be selected.

Return Fan HP >25 hp - The return fan hp is the horsepower listed on the return fan motor nameplate. Select this option if the return fan horsepower exceeds 25 hp.

Fan Variable Flow Control

Vane-Axial Fan w/Variable Pitch Blades – A vane axial fan resembles a propeller. When equipped with variable pitch blades, the blades are rotated or twisted (thus varying the pitch of the blades) to modulate the air flow from the fan.

Mechanical Adjustable-Speed Drive – A mechanical adjustable-speed drive uses mechanical devices to vary the speed of the fan–and therefore vary the flow of air–without varying the speed of the fan motor. One of the most common approaches is to vary the diameter of the shieves in the belt-drive.

Electrical Adjustable-Speed Drive - An electrical adjustable-speed drive is an electrical control system that will vary the speed of the fan motor, which will vary the flow of air. The most common type of electrical adjustable speed drive is the variable-frequency drive (VFD). A VFD is usually the most efficient approach to varying air flow from a fan.

Other Control – Many different types of fan air flow controls are available. Designers must use a combination of calculations, manufacturer's literature, and actual design conditions to determine the energy performance of different fan air flow controls.

Cooling Equipment Details Screen

The *Cooling Equipment Details* screen will appear if you have selected any of the *Cooling Equipment Type* options on the first screen other than *None*.

Select the *Condenser Type* and the *Capacity* range.

When you have finished your selections on the *Cooling Equipment Details* screen, click the *Next* button to proceed to the next screen in the series, or click the *Finish* button (if not grayed out) to accept all of the inputs and return to the *Mechanical* screen. You may

cancel the sequence of selections you have made at any time by pressing the **Esc** (escape) key.

Condenser Type

The condenser of an air conditioner is where refrigerant rejects heat absorbed during the process of cooling indoor spaces. As the refrigerant passes through the heat exchanger, it rejects heat to the surrounding fluid, usually air or water.

Air-Cooled – An air-cooled condenser is a refrigerant-to-air heat exchanger exposed to outdoor conditions. As refrigerant passes through the coils of the heat exchanger, heat is rejected to outdoor air (during cooling) and absorbed from outdoor air (during heating).

Evaporatively Cooled – An evaporatively-cooled condenser is similar to an air-cooled condenser with the exception that during cooling, the heat exchanger is sprayed with water, increasing heat rejection. Heat pumps and air conditioners equipped with evaporatively-cooled condensers are typically more efficient than their air-cooled counterparts.

Water-Cooled – A water-cooled condenser is a refrigerant-to-water heat exchanger. As refrigerant passes through the coils of the heat exchanger, heat is rejected to the water (during cooling) and absorbed from the water (during heating). Heat pumps with water-cooled condensers are typically connected to a central circulating water loop with other water loop heat pumps.

Capacity

Select the cooling capacity range for the cooling equipment selected on the first screen.

Economizer Details Screen

The *Economizer Details* screen will appear if the building location entered in the *Project* screen is located within a climate zone requiring an air economizer. The *Economizer Details* screen will not appear if:

- your building is located in climate zones 1, 2, or 3b; or

- the cooling capacity for the mechanical system is less than 90 kBtu/h.

Select the *Economizer Type.* If you do not have an economizer, select *None* for the *Economizer Type* and choose an *Economizer Exception*.

The input fields have the following interdependencies:

- Air economizers are not allowed if you selected *Single Fan, Dual Duct,* or *Three Duct* as the *Distribution Type* on the *Multiple-Zone Details* screen. An air economizer is not allowed with these system types.

- If you selected the *Water-Cooled* condenser, you will not be able to select *Filtration Requirements* or *Open Case Refrigeration* as an economizer exception.

- You will not be able to select *High Efficiency Equipment* as an *Economizer Exception* in climate zones 6a, 9a, 10a, 11a, 12a, 12b, 13a, 13b, 14a, 14b, 15, 16, 17, 18, or 19.

When you have finished your selections on the *Cooling Equipment Details* screen, click the *Finish* button to accept all of the inputs and return to the *Mechanical* screen. You may cancel the sequence of selections you have made at any time by pressing the **Esc** (escape) key.

Economizer Type

Air - An air economizer consists of a set of interlocked dampers on return air, exhaust air, and outside air ducts. During favorable weather conditions, the air economizer is controlled to use up to 100% outside air to cool the space instead of using mechanical refrigeration.

Water – A water economizer is a system by which the supply air of a cooling system is cooled indirectly with water that is itself cooled by heat or mass transfer to the environment without the use of mechanical cooling. Typically, water is first passed through a cooling tower, then through a hydronic coil in the supply air stream.

None – Select this option if an economizer will not be installed. Selecting this option will activate some or all of the *Economizer Exception* options. The *High Efficiency Equipment* exception will only be activated if the building resides in a climate zone for which the exception is allowed.

Economizer Exception

High Efficiency Equipment – In some cases, a high-efficiency air conditioner may use no more cooling energy than an air conditioner equipped with an air economizer that just meets the requirements. In these cases, the economizer may be omitted. The efficiency required to take this exception will be included in the requirements list.

Open Case Refrigeration – Air economizers can adversely affect the operation of open case refrigeration equipment such as that used in grocery stores to display refrigerated and frozen foods. This exception is not available if the cooling equipment has a water-cooled condenser, where a water economizer would be feasible.

Filtration Requirements – In some cases, unusual outdoor air pollutants necessitate extensive filtration of outdoor air. When an air economizer is installed, filtration equipment must be capable of purifying 100% outdoor air supply and would be prohibitively expensive. This exception is not available if the cooling equipment has a water-cooled condenser, where a water economizer would be feasible.

Plant Screen

The *Plant* button displays a screen that enables you to identify key characteristics of the plant equipment in your building. The term, "*Plant,"* refers to primary HVAC system components, including boilers, chillers, cooling towers, and pumps; not secondary HVAC system components such as fans, terminal boxes, radiators, coils, and package HVAC equipment.

The *Plant* screen allows you to describe the features of the building's plant(s) in sufficient detail to exclude requirements that do not apply to your building. The resulting simplification helps in designing the building to comply with the code and in code enforcement.

Round buttons (radio buttons) permit only one selection from each group.

Where multiple different HVAC plant components are present within the building, you may select the *Plant* button multiple times to enter more than one component. Where multiple identical (or nearly identical) plants are present, describe them once and use the *Quantity* field to indicate the number present.

Plant Equipment Details Screen

The *Plant Equipment Details* screen allows you to describe your central heating plant or central cooling plant. To enter a boiler, select a *Boiler Type, Heating Capacity Range,* and *Boiler Fuel.* To enter a chiller or condensing unit, select a *Cooling Plant Type, Condenser Type,* and *Cooling Capacity Range.*

When you have finished your selections on the *Cooling Equipment Details* screen, click the *Finish* button to accept all of the inputs and return to the *Mechanical* screen. You may cancel your selections by pressing the **Esc** (escape) key.

Boiler Type

Hot Water – Select this option if the central boiler is a hot water boiler.

Steam – Select this option if the central boiler is a steam boiler.

None – Select this option if you are describing a cooling plant instead of a central boiler.

Boiler Fuel

Gas – Select *Gas* if the boiler uses natural gas or propane.

Oil – Select *Oil* if the boiler uses new heating oil that has not been recycled or re-refined.

Residual Oil – Residual oil is fuel oil that remains after the removal of valuable distillates (such as gasoline) from petroleum and is used most often in industrial applications.

Heating Capacity Range

Select the heating capacity range for the boiler.

Cooling Plant Type

Condensing Unit – A condensing unit is the refrigeration system component that includes the refrigerant compressor and the condenser. Refrigerant lines are installed between the condensing unit and a refrigerant-to-water heat exchanger (creating a field-fabricated water chiller) or to a DX coil (creating a field-fabricated DX system).

Water Chiller – A water chiller is a self-contained piece of cooling equipment including, at a minimum, a refrigerant-to-water heat exchanger and a refrigeration compressor. Water is cooled in the refrigerant-to-water heat exchanger and piped to air handlers used for air conditioning throughout a building. Most water chillers include a water-cooled, air-cooled, or evaporatively-cooled condenser; however, some water chillers are manufactured without condensers.

Cooling Capacity Range

Select the cooling capacity range for the condensing unit or chiller. Ranges for condensing units are given in kBtu/h. Ranges for chillers are given in tons.

Service Water Heating Screen

The *Water Heating* button displays a screen that enables you to select two characteristics of the service water heating system(s) in your building. The selection (or deselection) of the two checkboxes on the *Service Water Heating Details* screen determines which water heating requirements apply to your building.

Where multiple different water heating systems are present within the building, you may select the *Water Heating* button multiple times to enter more than one system. Where

multiple identical (or nearly identical) systems are present, describe them once and use the quantity field to indicate the number present.

Service Water Heating Details Screen

The *Service Water Heating Details* screen allows you to provide basic information about your service water heating system. Checkboxes are provided for indicating whether or not your system has a circulation pump and/or if heat trace tape is installed.

When you have finished your selections on the *Service Water Heating Details* screen, click the *Finish* button to accept all of the inputs and return to the *Mechanical* screen. You may cancel your selections by pressing the **Esc** (escape) key.

System Details

System Has a Circulation Pump - A circulation pump is used in a service water heating system served by a continuous water loop. The circulation pump is controlled to circulate hot water from the water heating equipment as necessary to maintain a certain hot water temperature at all times in the circulation loop.

Heat Trace Tape Installed in the System - Heat trace tape is tape with embedded electric resistance heating elements. Heat trace tape is adhered to hot water piping. It is energized as necessary to deliver hot water at the desired temperature.

Building Use Types

The *Whole Building* types and the *Area Categories* available in the software are defined below.

Whole Building Types

Assembly – A building or structure for the gathering together of persons, such as auditoriums, churches, dance halls, gymnasiums, theaters, museums, passenger depots, sports facilities, and public assembly halls. (This building type cannot be used to demonstrate lighting compliance and will be disabled if the *Envelope and/or Mechanical Compliance Only* checkbox is not selected.)

Exercise Center – A building or structure used for recreational activities involving physical exertion designed to promote physical fitness and well-being.

Grocery Store – A building or structure that has as its primary purpose the sale of foodstuffs requiring additional preparation prior to consumption.

Hotel/Motel – A building or structure for transient occupancy; e.g., resorts, hotels, motels, barracks, or dormitories.

Library – A building or structure in which literary and artistic materials, such as books, periodicals, and audiovisuals, are kept for reading, reference, and loan.

Medical and Clinical Care – A building or structure for the purpose of providing medical treatment, confinement or care, and sleeping facilities such as hospitals, sanitariums, clinics, orphanages, nursing homes, mental institutions, and reformatories.

Multifamily – A building or structure containing three or more dwelling units. (This building type cannot be used to demonstrate lighting compliance and will be disabled if the *Envelope and/or Mechanical Compliance Only* checkbox is not selected.)

Museum – A building used for the display and preservation of objects of artistic, scientific, or cultural interest.

Office – A building or structure for office, professional, or service type transactions such as medical offices, banks, libraries, and government office buildings.

Religious Worship – A building for worship, religious services, and associated social and educational functions.

Restaurant – A building or structure for the preparation and consumption of food or drink, including coffee shops, cafeterias, bars, and fast food and leisure restaurants.

Retail Sales, Wholesale Showroom – A building or structure for the display and sale of merchandise such as shopping malls, food markets, auto dealerships, department stores, and specialty shops.

School – A building or structure for the purpose of instruction such as schools, colleges, universities, and academies.

Storage, Industrial and Commercial – A building or structure for storage, such as aircraft hangars, garages, warehouses, storage buildings, and freight depots.

Theater—Motion Picture – An assembly room, hall, or building with tiers of rising seats or steps for the showing of motion pictures.

Theater—Performance – An assembly room, hall, or building with tiers of rising seats or steps for the viewing of dramatic performances, lectures, musical events, and similar live performances.

Other – A building or structure whose intended use is currently not known or does not match any of the above categories.

Area Categories

The following area categories are listed in the software. For area categories other than those given, select categories with similar areas and/or activities.

Auditorium – An area with fixed seats used for public meetings or gatherings not specifically for the viewing of dramatic performances.

Bank/Financial Institution – An area for conducting financial transactions, including the custody, loan, exchange, or issue of money, for the extension of credit and for facilitating the transmission of funds.

Classroom/Lecture Hall – An area of a building where classes meet.

Convention, Conference or Meeting Center – An area used for meetings, conventions, and multiple purposes, including dramatic performances, that has neither fixed seating nor fixed staging.

Corridor, Restroom, Support Area – Corridor – an area used as a passageway to access compartments or rooms. Restroom: An area providing personal facilities such as toilets and washbasins. Support: An area used as a passageway, utility room, storage space, or other use associated with the building's primary function.

Dining – An area in a restaurant or hotel/motel (other than guest rooms) where meals served to the customers are consumed.

Exercise Center – An area of a building for recreational activities involving physical exertion designed to promote physical fitness and well-being.

Exhibition Hall – An area used for exhibition that has neither fixed seating nor fixed staging.

Grocery Store – An area of a building that has as its primary purpose the sale of foodstuffs requiring additional preparation prior to consumption.

Gymnasium Playing Surface – An area of a building for organized athletic games such as basketball, volleyball, racquetball, and tennis.

Hotel Function – An area such as a hotel ballroom, meeting room, exhibit hall, or conference room, together with prefunction area and other spaces ancillary to its function.

Hotel/Motel Guest Room – A room or suite of rooms in a building for transient occupancy (such as a resort, hotel, motel, barracks, or dormitory), including living and sleeping areas, private bathrooms, and kitchenettes. (Note that hotel/motel guest rooms are exempt from lighting requirements but are included in the area category list for consistency and for use in determining internal loads for envelope compliance.)

Industrial Work, < 20 ft ceiling height – An area of a building in which a manufacturing operation, craft, or art is performed having a ceiling less than 20 ft above the floor.

Industrial Work, >= 20 ft ceiling height – An area of a building in which a manufacturing operation, craft, or art is performed having a ceiling 20 or more ft above the floor.

Kitchen – An area containing facilities for cooking and food preparation.

Library – An area of a building in which literary and artistic materials, such as books, periodicals, and audiovisuals, are kept for reading, reference, and loan.

Lobby—Hotel – An area in a hotel/motel between the main entrance and the front desk, including waiting and seating areas, and other spaces encompassing the activities normal to a hotel lobby function.

Lobby—Other – An area located directly inside the main entrance of a building and includes the reception area, sitting areas, and public areas.

Mall, Arcade, or Atrium – An area of a building used as a public passageway or concourse that provides access to rows of stores or shops.

Medical and Clinical Care – An area of a building where medical treatment is provided such as hospitals, sanitariums, clinics, orphanages, nursing homes, mental institutions, and reformatories.

Multifamily Living Unit – A private room or group of rooms for nontransient residential living that occur within a building or structure containing three or more dwelling units. (Note that multifamily living units are exempt from lighting requirements but are included in the area category list for consistency and for use in determining internal loads for envelope compliance.)

Museum – An area of a building used for the display or preservation of objects of artistic, scientific, or cultural interest.

Office – An area of a building for office, professional, or service-type transactions such as medical offices, banks, libraries, and government office buildings.

Religious Worship – An area of a building for worship or religious services.

Restaurant – An area of a building for the preparation and consumption of food or drink, including coffee shops, cafeterias, bars, and fast-food and leisure restaurants.

Retail Sales, Wholesale Showroom – An area of a building in which the primary activity is the sale of merchandise or the display of samples of merchandise.

Storage, Industrial and Commercial – An area of a building for storing items.

Theater—Motion Picture – An area of a building with tiers of rising seats or steps for the showing of motion pictures.

Theater—Performance – An area of a building with tiers of rising seats or steps for the viewing of dramatic performances, lectures, musical events, and similar live performances.

Other – An area of a building whose intended use is currently not known or does not match any of the above types.

Glossary

AAMA

Architectural Aluminum Manufacturers Association

Air Economizer Systems

Ducting arrangements and automatic control systems that allow a cooling supply fan system to supply outdoor (outside) air to reduce or eliminate the need for mechanical refrigeration during mild or cold weather.

Alteration

Any change to a building's water heating system, space conditioning system, lighting system, or envelope that is not classified as an addition.

ASHRAE/IES Standard 90.1-1989

The American Society of Heating, Refrigerating and Air-Conditioning Engineers/Illumination Engineering Society Standard 90.1-1989.

Automatic Time-Switch Controls

Controls that automatically switch lights or equipment on and off.

Automatically Operated Control Damper

A damper which automatically opens and closes.

Ballast

A device used to operate fluorescent and HID lamps. The ballast provides the necessary starting voltage, while limiting and regulating the lamp current during operation.

Below-Grade Wall

Portions of the wall below grade.

Boiler

A pressurized system in which water is vaporized to steam by heat transferred from a source of higher temperature, usually the products of combustion from burning fuels. Steam thus generated may be used directly as a heating medium, or as the working fluid in a prime mover to convert thermal energy to mechanical work, which in turn may be converted to electrical energy.

Building Envelope

The elements of a building that enclose conditioned spaces through which thermal energy may be transferred to or from the exterior or to or from unconditioned spaces.

Ceiling

Those portions of the building envelope, including all opaque surfaces, fenestration, doors, and hatches, that are above conditioned space and are horizontal or titled at less than 60 degrees from horizontal.

Circulation Pumps

Pumps that are used to keep hot water circulating through the distribution system.

Circulating Water Heater

Hot water continuously circulates through the distribution system.

Commercial Building

Includes but is not limited to occupancies for assembly, business, education, institutions, merchants, and storage.

Compact Fluorescents

Small fluorescent lamps that are often used as an alternative to incandescent lighting. The lamp life is about 10 times longer than incandescent lamps and is 3-4 times more efficacious.

Concrete Masonry Unit Walls

Concrete masonry unit walls may be insulated by filling the empty core with perlite, vermiculite, or some other insulative material. In some cases, even with filled cores, these wall types require additional insulation.

Conditioned Floor Area

The horizontal projection of that portion of interior space which is contained within exterior walls and which is conditioned directly or indirectly by an energy-using system.

Conditioned Space

A cooled or heated space, or an indirectly conditioned space.

Connected Lighting Load

The sum of all non-exempt interior lighting power, measured in watts.

Cooled Space

An enclosed space within a building that is cooled by a cooling system whose capacity (a) exceeds 6 Btu per hour per square foot or (b) is capable of maintaining a space dry-bulb temperature of 90 degrees F or less at design cooling conditions.

Domestic Water Heating System

DHW systems may be circulating or non-circulating.

Economizer

A ducting arrangement and automatic control system that allow a cooling supply fan system to supply outdoor air to reduce or eliminate the need for mechanical refrigeration during mild or cold weather.

Efficacy

A metric used to compare light output to energy consumption. Efficacy is measured in lumens per watt. Efficacy is similar to efficiency, but is expressed in dissimilar units. For example, if a 100-watt source produces 9000 lumens, then the efficacy is 90 lumens per watt.

Electronic High-Frequency Ballasts

Electronic ballasts improve fluorescent system efficacy by converting the standard 60 Hz input frequency to a higher frequency, usually 25,000 to 40,000 Hz. Lights operating on these frequencies produce about the same amount of light, while consuming up to 30% less power than a standard magnetic ballast.

Enclosed Space

A volume substantially surrounded by solid surfaces such as walls, floors, roofs, and openable devices such as doors and operable windows. Spaces not meeting these criteria for enclosure are considered to be exterior to the building for purposes of determining envelope requirements. For example, most parking garages do not qualify as enclosed space.

Envelope Components

The building assemblies that provide a barrier between conditioned space and unconditioned space. This includes the floors, walls, and ceiling/roof assemblies of the building.

EER

The energy efficiency ratio is the ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions. When consistent units are used, this ratio becomes equal to coefficient of performance.

Fan Coil

A fan-coil terminal is essentially a small air-handling unit which serves a single space without a ducted distribution system. One or more independent terminals are typically located in each room connected to a supply of hot and/or chilled water. At each terminal, a fan in the unit draws room air (sometimes mixed with outside air) through a filter and blows it across a coil of hot water or chilled water and back into the room.

Fenestration

The terms "fenestration", "window", and "glazing" are often used interchangeably. However, fenestration refers to the design and position of windows, doors and other structural openings in a building.

Floor

A horizontal exterior partition, or a horizontal demising partition, under conditioned space which separates conditioned space from unconditioned space.

Fluorescent Lamps

A light source consisting of a tube filled with argon, along with krypton or other inert gas. When electrical current is applied, the resulting arc emits ultraviolet radiation that excites the phosphors inside the lamp wall, causing them to radiate visible light.

Fuel-Fired Furnace

A self-contained, indirect-fired furnace that supplies heated air through ducts to spaces that require it.

Glazing

The terms "fenestration", "window", and "glazing" are often used interchangeably. However, glazing is the transparent component of glass or plastic windows, doors, clerestories, or skylights.

Glazing U-Factor

Based on the interior-surface area of the entire assembly, including glazing, sash, curbing, and other framing elements. Center-of-glass U-factors cannot be used.

Gross Wall Area

Includes the opaque area of all above-grade exterior walls enclosing conditioned spaces (including above-grade portions of below-grade wall assemblies but excluding walls separating conditioned from unconditioned space); the area of the band joist and subfloor between floors; and the area of all doors and windows.

Gross Window Area

Includes the rough-opening area of the window, not just the transparent-glass area.

Heat Pump

One or more factory-made assemblies which include an indoor conditioning coil, compressor(s) and outdoor coil or refrigerant-to-water heat exchanger, including means to provide both heating and cooling functions.

Heat Traps

Devices or piping arrangements that effectively restrict the natural tendency of hot water to rise in vertical pipes during standby periods. Examples are the U-shaped arrangement of elbows or a 360-degree loop of tubing.

Heated Space

An enclosed space within a building that is heated by a heating system whose output capacity (a) exceeds 10 Btu per hour per square foot and (b) is capable of maintaining a space dry-bulb temperature of 50 degrees F or more at design heating conditions.

HID

High intensity discharge. Generic term describing mercury vapor, metal halide, high pressure sodium, and (informally) low pressure sodium light sources and luminaires.

High-Pressure Sodium Lamps

High-intensity discharge (HID) lamps whose light is produced by radiation from sodium vapor (and mercury).

High-Rise Residential Buildings

Hotels, motels, apartments, condominiums, dormitories, and other residential-type facilities that provide complete housekeeping or transient living quarters and are over three stories in height above grade. Hotels, motels, and other buildings with itinerant occupancies are covered by the "commercial" code regardless of height.

HVAC

Heating, ventilating, and air-conditioning

HVAC System

The equipment, distribution network, and terminals that provide either collectively or individually the processes of heating, ventilating, or air conditioning to a building.

ICAA

Insulation Contractors Association of America

ICC

International Code Council

IMC

International Mechanical Code

Indirectly Conditioned Space

An enclosed space within a building that is not a heated or cooled space, whose area-weighted heat transfer coefficient to heated or cooled spaces exceeds that to the outdoors or to unconditioned spaces; or through which air from heated or cooled spaces is transferred at a rate exceeding three air changes per hour. (Also see Heated Space, Cooled Space, and Unconditioned Space.)

Insulation R-Values

R-values are used to rate insulation and are a measurement of the insulation's resistance to heat flow. The higher the R-value, the better the insulation.

Integrated-Control Economizers

Allows the cooling load of a building or space to be partially met by supplying outside air while the rest of the load is met by the refrigeration equipment within an HVAC system. Field- and factory-installed economizers supplied by major equipment manufacturers include integrated controls.

Interior-Lighting Controls

Offer the ability for systems to be turned on and off either manually or automatically and include switches, time clocks, occupancy sensors and other devices that regulate a lighting system.

Interior Lighting Power Limits

The maximum total wattage for a building or space that can be installed to meet the provisions of the energy code.

Longitudinal Seam

A duct seam that is parallel to the direction of air flow.

Luminaire

A complete lighting unit consisting of a lamp or lamps, along with the parts designed to distribute the light, hold the lamps, and connect the lamps to a power source. Also called a fixture.

Mechanical System

The system and equipment used to provide heating, ventilating, and air conditioning functions as well as additional functions not related to space conditioning, such as, but not limited to, freeze protection in fire protection systems and water heating.

Metal Building Walls and Roofs

Special attention to the design and construction of metal buildings is required to ensure these buildings meet the COM*check-EZ* requirements. Two key elements exist in metal buildings that are not found in other building classes – thermally broken connections between the purlin and metal roof sheet and compression of insulation behind wall girths and roof purlins.

COM*check-EZ* includes requirements for metal building walls and roofs. These requirements are specified in the "Walls Framed – Metal Framing" category and in the "Roofs Metal Purlin" category in the Prescriptive Packages. There are two classes of metal building roofs. One class uses traditional techniques that drape the insulation over the purlin and fasten the metal roof sheets through the insulation directly to the purlin. The second class requires that a thermal block be placed between the metal roof sheet and purlin.

A thermal block consists of foam blocks or other materials/techniques that prevent heat from migrating from the purlin directly to the metal roof sheet. Compressed fiberglass batt insulation does not qualify as a thermal block.

Metal Halide Lamps

A type of high intensity discharge (HID) lamp in which most of the light is produced by radiation of metal halide and mercury vapors in the arc tube. Available in clear and phosphor-coated lamps.

NWWDA

National Wood Window and Door Association

Occupancy Type

The type of activity occurring within a building.

Occupant-Sensing Device

A device that detects the presence or absence of people within an area and causes any combination of lighting, equipment, or appliances to be adjusted accordingly.

Packaged Boiler

A self-contained unit that generally requires little maintenance.

Packaged Terminal Air Conditioner

A factory-selected wall sleeve and separate unencased combination of heating and cooling components, assemblies, or sections (intended for mounting through the wall to serve a single room or zone). It includes heating capability by hot water, steam, or electricity.

Packaged Terminal Heat Pump

A packaged terminal air conditioner capable of using the refrigeration system in a reverse cycle or heat pump mode to provide heat.

Permanently Wired Luminaires

Light fixtures physically attached to a surface (e.g. ceiling or wall) using a permanent mounting system and wired directly to a power source. Examples include fluorescent fixtures located in a ceiling grid and wall sconces.

Perm Rating

The amount of water vapor that passes through an area in a certain period of time.

Photocell

A light sensing device used to control luminaires and dimmers in response to detected light levels.

Plenum

An enclosure that is part of the air-handling system and is distinguished by having a very low air velocity. A plenum often is formed in part or in total by portions of the building.

Projection Factor

The exterior horizontal shading projection depth divided by the sum of the height of the fenestration and the distance from the top of the fenestration to the bottom of the external shading projection in units consistent with the projection depth.

Residential Buildings

Detached one and two family dwellings. A building containing multiple (i.e., three or more) dwelling units where the occupants are primarily permanent in nature, such as townhouses, row houses, apartment houses, convents, monasteries, rectories, fraternities and sororities, dormitories, and rooming houses, all of which are three stories or less in height above grade.

Roof

Those portions of the building envelope, including all opaque surfaces, fenestration, doors, and hatches, that are above conditioned space and are horizontal or tilted at less than 60 degrees from horizontal.

R-Value

Thermal resistance to heat flow. A larger number means less heat flow.

Service Water Heating

The supply of hot water for purposes other than comfort heating and process requirements.

Single-zone, Unitary HVAC Systems

Unitary HVAC systems that serve a single zone. Single zone systems can provide either heating or cooling, but provide supply air at the same volume and temperature to the entire zone which they serve.

Skylight

Glazing that is horizontal or tilted less than 60 degrees from horizontal.

Shading Coefficient

The ratio of solar heat gain through fenestration, with or without integral shading devices, to that occurring through unshaded 1/8-in.-thick double-strength glass.

Solar Heat Gain Coefficient

The glazing's effectiveness in rejecting solar heat gain. SHGC is part of a system for rating window performance used by the National Fenestration Rating Council (NFRC). SHGC is gradually replacing shading coefficient (SC) in product literature and design standards.

Split System

Split-system HVAC equipment has the indoor and outdoor coils within separate cabinets. For a cooling only system, the outdoor cabinet would contain the condenser coil and the indoor cabinet would contain the evaporator coil.

Structural Masonry Wall

A wall construction category used with masonry, precast and poured-in-place concrete, and concrete masonry units. You can select from among six specific types of masonry wall constructions by clicking the *Ext. Wall* button and selecting *Structural Masonry Wall* or by clicking the *Basement* button.

Switched Receptacles

The ability to turn power on and off to an electrical outlet by using a control switch.

Tandem Wiring

A wiring option in which a ballast is shared by two or more luminaires. This reduces labor, materials, and energy costs.

Temperature Reset Controls

Controls that automatically reset supply water temperatures by representative building loads (including return water temperature) or by outside air temperature.

Thermostat

An automatic control device responsive to temperature.

Thermostat Set Back

Usually done at night to reduce the amount of conditioning provided at night by allowing the interior temperature to drift naturally to a marginal temperature during the night and then to recondition it to normal conditions in the morning.

Transverse Seam

All duct seams other than the longitudinal seam (which runs parallel to the direction of air flow).

U-Factor

The amount of heat in Btu that flows each hour through one square foot, when there is a 1 degree F temperature difference across the surface. The smaller the number, the less heat flow.

UL 181A

A test procedure for tapes and mastics used to seal ductwork.

UL 181B

A test procedure for tapes and mastics used to seal ductwork.

Unconditioned Space

An enclosed space within a building that is not a conditioned space.

Unitary-Packaged

Each package is a standalone system which provides all of the heating and cooling requirements for the area of the building which it serves.

Vapor Retarder

A component that retards water vapor diffusion, but does not totally prevent its transmission. Vapor retarder material is usually a thin sheet or coating. However, a construction of several materials, some perhaps of substantial thickness, could also constitute a vapor retarder system.

Variable-Air Volume (VAV) System

HVAC system that controls the dry-bulb temperature within a space by varying the volume of heated or cooled supply air to the space.

Variable-Frequency Drive

Changes the speed of the motor by changing the voltage and frequency of the electricity supplied to the motor based upon system requirements.

Ventilated Naturally

The process of supplying or removing air by natural means to or from any space.

Ventilated Mechanically

The process of supplying or removing air by mechanical means to or from any space. Such air may or may not have been conditioned.

Visible Light Transmittance

The fraction of solar radiation in the visible light spectrum that passes through the fenestration.

Wall

Opaque portion of the building envelope.

Water Heating

The process or system used to heat service water.

Water Temperature Reset

Temperature shall be reset by at least 25% of the design supply-to-return water temperature difference.

Window

The terms "fenestration", "window", and "glazing" are often used interchangeably. However, window actually describes a system of several components. Window is the term given to an entire assembly comprised of the sash, glazing, and frame.

Window-Wall Ratio

The gross window area divided by the gross wall area.

Zone

A space or group of spaces within a building with any combination of heating, cooling, or lighting requirements sufficiently similar so that desired conditions can be maintained throughout by a single controlling device.